THE GEOGRAPHICAL JOURNAL

ROOM USE ONLY

Serial Dept.
JUL 19 1961

Vol CXXVII Part 2 June 1961

PRINCE HENRY THE NAVIGATOR AND THE DISCOVERY OF THE SEA ROUTE TO INDIA — Erik Axelson — 145

GEOGRAPHY AND GEOGRAPHERS IN THE SOVIET UNION — R. A. French — 159

THE SECOND LAND USE SURVEY: PROGRESS AND PROSPECT — Alice Coleman — 168

PROBLEMS AND DEVELOPMENT OF THE DRY ZONE OF WEST AFRICA — R. J. Harrison Church — 187

THE DEPTH OF SOME LAKES IN SNOWDONIA — A. M. Ferrar — 205

GROWING MOUNTAINS AND INFANTILE ISLANDS ON THE WESTERN PACIFIC RIM — Sir Charles Cotton — 209

OVERPOPULATION AND OVERSTOCKING IN THE NATIVE AREAS OF MATABELELAND — J. R. V. Prescott — 212

ONE HUNDRED YEARS AGO — 225

ALEXANDER VON HUMBOLDT: CENTENARY STUDIES: Review — G. R. Crone — 226

THE EXPLORATION OF CENTRAL AFRICA: Review — J. N. L. Baker — 229

THE ROYAL GEOGRAPHICAL SOCIETY, LONDON, S.W.7

JOHN MURRAY (PUBLISHERS) LTD., 50 ALBEMARLE STREET, W.1.

PRICE TEN SHILLINGS

THE GEOGRAPHICAL JOURNAL is the journal of the Royal Geographical Society and is edited by the Director. It contains accounts of recent exploration and travel, original contributions to geographical research, papers read at the meetings of the Society, and articles on every aspect of geography as well as on the geographical aspects of other sciences. It is fully illustrated with photographs and with maps compiled or drawn from the authors' surveys by the draughtsmen of the Society. It contains also reviews of geographical books and maps; the Society's News; a Record of geographical work; and letters from correspondents. Contributions to the *Journal* should be addressed to the Editor.

The *Journal* is sent free to all Fellows of the Society. Copies are available to the public from the Office of the Society. It may also be ordered through booksellers and John Murray (Publishers) Ltd., 50 Albemarle Street, W.1, who is responsible for trade distribution.

The subscription rate is Forty-three Shillings (Forty-two Shillings and Sixpence overseas) per year, post free, single copies Ten Shillings, plus postage.

ADVERTISEMENTS: All inquiries for Advertisement space in the *Journal* should be addressed to the Office of the Society, Telephone Kensington 2173.

Neither the Society nor the Editor is responsible for the opinions or statements of contributors to the Geographical Journal.

The Postal Address of the Society is
KENSINGTON GORE, LONDON, S.W.7
The address for Inland Telegrams is
OBTERRAS SOUTHKENS LONDON
and for Cablegrams
OBTERRAS LONDON
The Telephone Number is KENSINGTON 5466 (5 lines)

The
GEOGRAPHICAL JOURNAL

Vol CXXVII Part 2 *June 1961*

PRINCE HENRY THE NAVIGATOR AND THE DISCOVERY OF THE SEA ROUTE TO INDIA

The first Eva G. R. Taylor lecture

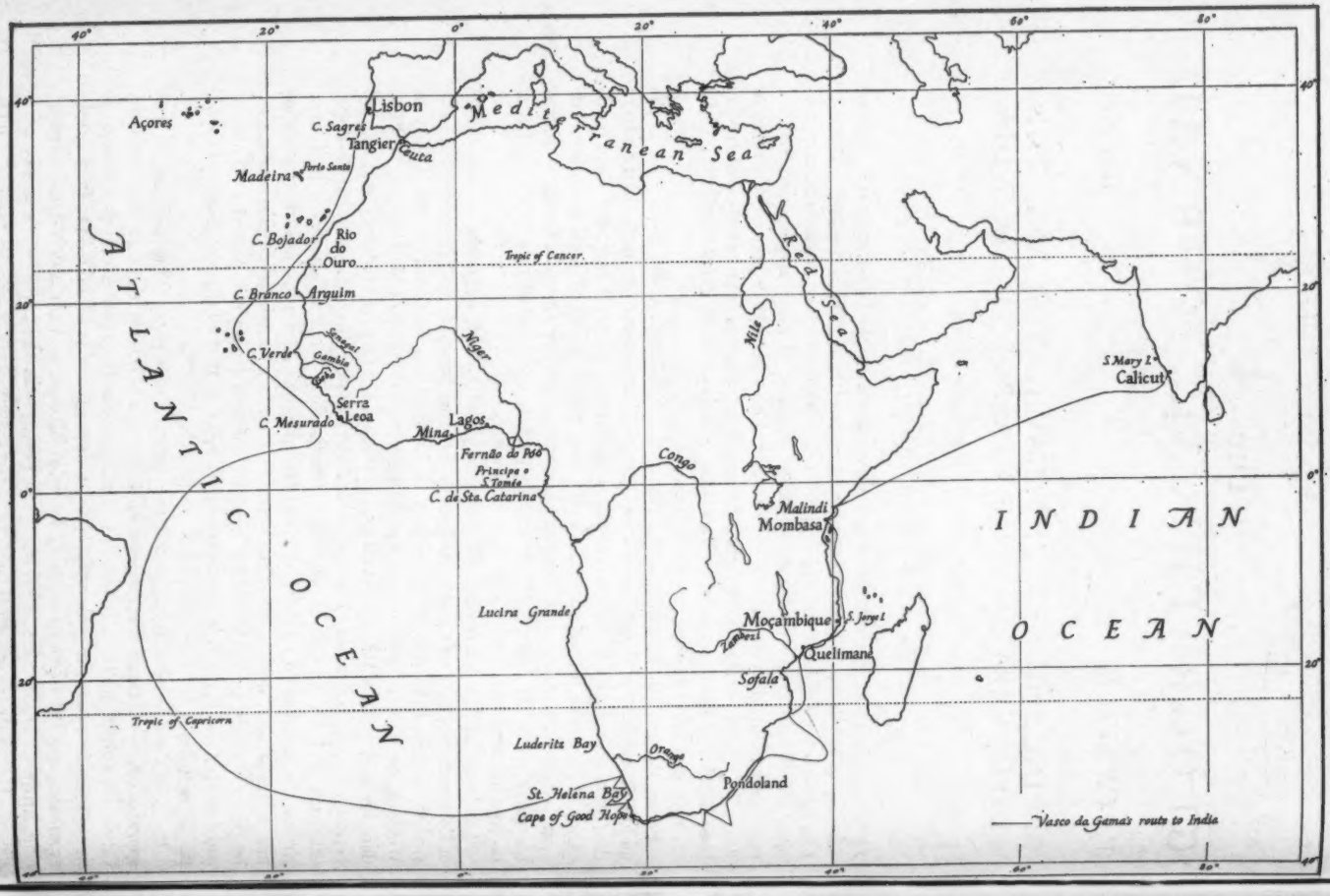
ERIC AXELSON

THIS YEAR, 1960, Portugal has been commemorating the five-hundredth anniversary of the death of Dom Henrique—Prince Henry, "the Navigator". Since to him has been attributed the application of astronomy to navigation, and responsibility for the discovery of the sea route to India, it is most appropriate that the organizers of this lecture should have chosen such a subject in honour of Professor E. G. R. Taylor—the arch-navigator. I am very conscious of the honour of having been invited to speak on so great a subject, in honour of so great a scholar; and I am very conscious of my responsibilities.

Portugal came into existence at the cost of the Spaniard and the Moor; but by the middle of the thirteenth century she had attained her present frontiers. Cut off from the rest of Europe by frequent hostilities, and unable to wrest from her soil a sufficiency of food, she turned naturally to the sea. Her fishermen, pushing out into the broad Atlantic, became consummate fishermen; and her vessels carried to distant European ports her exports of salt and salted fish, cork and olive oil. The Atlantic became her first ally. She was soon to gain a second.

The battle of Aljubarrota in 1385 guaranteed for the time being the independence of Portugal, but fear of Castile remained. English bowmen had helped secure the victory, and in 1386 the earlier Treaty of London was replaced by the Treaty of Windsor, by which Portugal and England agreed "there shall be inviolate, and endure for ever . . . a solid, perpetual and real league, unity, confederacy and union" between the two countries. Further to bind the alliance King João married Philippa, daughter of John of Gaunt who was commanding the English forces in Iberia. Henry, the third child to survive, was born in 1394. Authentic information about him is lamentably lacking, and the chronicle of Zurara remains the main source (see list of authorities, p. 154). We are ignorant even of Henry's appearance (the most authoritative work on this controversial subject is that of Ernest Soares (1959), which includes a full bibliography.)

In 1409 a senior official suggested the capture of Ceuta. This capture, it was appreciated, would aid the passage of Christian shipping through the Strait of Gibraltar, and complicate Moorish communication between Africa and Spain; it would provide a base for raids on Moorish shipping; and it would lead to Portuguese expansion into the wheat-producing lands of Morocco. After much detailed planning, upwards of 200 vessels set out from Portugal in 1415 with some 20,000 men aboard. Henry displayed great courage in the assault, and he and his elder brothers,


Açores
Lisbon
C. Sagres
Tangier
Ceuta
Madeira
Porto Santo
C. Bojador
Rio do Ouro
C. Branco
Arguim
C. Verde
Senegal
Gambia
Niger
Serra Leoa
C. Mesurado
Mina
Lagos
Fernão do Pó
Principe e S. Tomé
C. de Sta. Catarina
Congo
Lucira Grande
Tropic of Capricorn
Luderitz Bay
Orange
St. Helena Bay
Cape of Good Hope
Pondoland
Malindi
Mombasa
Moçambique
S. Jorge I.
Zambezi
Quelimane
Sofala
S. Mary I.
Calicut
Tropic of Cancer
Nile
Red Sea
Mediterranean Sea
ATLANTIC OCEAN
INDIAN OCEAN
Vasco da Gama's route to India

who had been brought up in an atmosphere of chivalry, were knighted on the field of battle.

Portugal's capture of Ceuta burst the geographical bounds of Europe; it initiated expansion into Africa—and beyond. More immediately, in Ceuta Portugal learnt at first hand about the geography of north-west Africa; and details of the gold trade, especially, must have provided inducement for further advance (Bovill, 1933; Taylor, 1927; Mauny, 1960, pp. 55–8). In 1418 Henry assisted in the relief of Ceuta from Moorish attack; immediately afterwards he started casting his eyes southwards. There is no reason to doubt Zurara's reasons for Henry's interest in exploration: simply to know the country beyond C. Bojador, then the limit of Europe's knowledge of the north-west African coast; to bring back articles of trade, and generally to increase commerce; to reconnoitre the strength of the Moors; to search for Christian princes who would serve as allies in the war against the Moors; and lastly and incidentally to increase the Christian faith.

Maritime expansion began with the rediscovery of Porto Santo in 1419 (when two of Henry's squires raiding Moorish shipping were blown off course) and of Madeira in 1420. These islands were occupied primarily to forestall the Castilians; but the colonization of Madeira soon provided economic returns from timber and sugar; and voyages there and back added to knowledge of the winds.

Attempts to round Bojador began in 1422. Magalhães Godinho suggests that the main reason for the lack of immediate success was that piracy against Moorish vessels was more remunerative (Godinho 1956, I, 242). Professor Taylor has stressed that the difficulty was not so much in rounding Bojador as in returning against the prevailing northerly and north-easterly winds and currents. The rediscovery in 1427, however, of the Açores, which lay in the region of variable winds, provided the key to the problem, and before long vessels returning from the African coast were heading out into the Atlantic, before taking advantage of winds which, in the winter, were often from the south and south-west (Taylor, 1956, p. 159). Some Portuguese writers insist that these voyages to and from Madeira and the Açores postulate astronomical navigation by this time (Fontoura da Costa, 1960, p. 35); but there is no evidence of this, and mariners appear to have had no other aids than their compasses, and rhumb-lined charts; nor was magnetic variation yet understood.

In 1434 Gil Eanes succeeded in rounding Bojador (lat. 26° 07′ N.); the next year he and Gonçalves Baldaia sailed fifty leagues beyond, and in 1436 Baldaia reached the over-optimistically named Rio do Ouro (lat. 23° 37′ N.). But in 1437 came the ill-led and disastrous expedition to Tangier, when Henry and his entire army were forced to surrender. He undertook to hand over Ceuta to the Moors, and gave his youngest brother as hostage; but Portugal refused to ratify such retrocession and the unfortunate brother remained in captivity until his death. In 1438 King Duarte, Henry's eldest brother, died, leaving a son aged six. Henry had some share in the negotiations which confirmed the ousting of the widowed Queen, a Spaniard, and the appointment of Pedro, Henry's widely-travelled, cultured and intelligent elder brother, as Regent (Gonçalves, 1955). There can be little doubt that from that date, 1440, until his death Pedro became primarily responsible for the impetus now given to maritime exploration.

In 1441 Nuno Tristão in a caravel, the first time that a vessel of this type is referred to in the records, and Antão Gonçalves took the first captives on this stretch of coast. Tristão may have continued to C. Branco (lat. 20° 46′ N.), which was passed the next year by Gonçalo de Sintra and Dinis Dias; in 1443 Tristão reached Arguim. Private expeditions set out, with Pedro's blessing, to trade for gold and for slaves. In 1444 Tristão reached the Senegal, which marked the end of the Sahara's

contact with the Atlantic, and Dinis Dias passed beyond C. Verde (lat. 14° 43′ N.). In 1446 Tristão met his death at the mouth of the Gambia, but Alvaro Fernandes passed beyond that river. The Bianco map of 1448 records these discoveries. Trade in negroes made voyages worth while, but this commerce, and further exploration, suffered interruption. Pedro had approved the elevation of an illegitimate son of João I as Duke of Bragança; the Duke gained dominance over the youthful King Afonso V and set him against Pedro. Henry failed to intervene on behalf of Pedro, who was killed in the battle of Alfarrobeira, 1449. It was not until 1456 that exploration was resumed.

In 1456 Cadamosto and Diogo Gomes reached the Rio Grande, which was most likely the Geba. Four years later Pedro de Sintra reached the Serra Leoa (lat. 8° 30′ N.) which, despite all the arguments of Jaime Cortesão (1940, 1960, pp. 30–3), remains generally accepted as the limit of African exploration at the time of Henry's death.

Henry was a man of many parts. As brother and uncle and counsellor of kings he had to spend much time at court. He was Master of the Order of Christ, which required his frequent attendance at Tomar, and Duke of Viseu, lord of Covilhã, etc., with their separate commitments. To supplement his numerous direct revenues, he was given several monopolies, including one of tunny fishing in the Algarve. He also received 20 per cent., or the remission of the 20 per cent. due to the King, on all goods imported from beyond Bojador. These goods were landed almost exclusively at Lagos, and it was at Lagos more often than not, or in nearby Raposeira, that he used to reside, the better to direct his exploring and commercial enterprises. Since he was a man of action himself, men flocked round him, and he listened eagerly to their reports of discovery and achievement. Being a man of means, he could induce men, including foreigners such as Jafuda Cresques, the cartographer, to serve him. That he maintained a school of navigation is a myth; but there was constant informal exchange of knowledge in the house of the patron, Henry, wherever he might be.

There is no evidence that Henry ever lived on C. Sagres, except perhaps for the last few weeks of his life, and even that is problematical. It is true that in 1443 Pedro granted Henry a cape, called the Cabo de Trasfalmenar, and a league about it, for the founding of a *vila*. But the purpose of this Henry explained in a testament of 1460. Vessels often had to wait off Sagres for many days for a favourable wind, without food, without water and without the comforts of religion, because the nearest village was one and a half leagues away. "I therefore ordered a *vila* to be built on the other cape, which is situated before the said C. Sagres to those who come from west to east, which was called Terçanabal, to which *vila* I gave the name Infante." In view of this confusion, and in the absence of any contemporary map or description, it is impossible to determine the exact site of this small fortified village (Silva Marques, 1944, I, 436–7, 586; Gomes, 1940, pp. 81–91, Malpique, n.d.). The earliest plan known is that drawn by an Englishman in 1587 (B.M. Cotton MSS. Aug. I ii 113).

In another testament Henry declared that he had had three aims in life: to gain knowledge about unknown seas and countries for the benefit of Christianity; to convert the heathen; and to develop commerce. The last he certainly did; his religious impulses grew stronger in his latter years; and he was responsible for the discovery of a great stretch of coast. His achievements, however, should not be exaggerated. Magalhães Godinho lists thirty-five recorded voyages made between 1419 and 1460; of these only eight were on Henry's initiative, and two of divided inspiration; while of the 360 leagues of coastline discovered in those years, 200 were during the eight years of Pedro's vigorous regency (Godinho, 1956, III, 319–22). The explorations, in fact, were a national, not an individual effort. Too grandiose ambitions must not

By permission of the Trustees of the British Museum

The battle of Aljubarrota, 1385; from a miniature in a late fifteenth century Flemish MS. (B.M. Royal MS. 14 E. iv, f. 204)

By permission of the Trustees of the British Museum

Marriage of King João I of Portugal and Philippa of Lancaster; from the same MS. (B.M. Royal MS. 14 E. iv, f. 284)

Commonly accepted portrait of Prince Henry attributed to Nuno Gonçalves; detail of a triptych painted about 1457–9 and now in the Musea de Arte Antiga, Lisbon

be attributed to Henry. He had no plan to reach India; Ethiopia was his most advanced objective (Cordeiro de Sousa, 1940, p. 100; Leite, 1959, pp. 96–122; Peres, 1943, pp. 36–8).

Nor should excessive claims be made for Henry in the direction of astronomical navigation. There may have been instrumental aids to help pilots to and from Madeira and the Açores in the second quarter of the fifteenth century of which we are ignorant. Certainly pilots returning from the Guinea coast early adopted the *volta do mar*, which is confirmed by the fact that in 1446 the survivors of Tristão's vessel, a clerk, a seaman and three boys, returned from the Gambia without sighting land, and made their landfall only twenty leagues from their destination. But the first record of any scientific observation at sea dates only to 1451, when a sister of Afonso V, on her way to Italy, had in her retinue "magistris astrologis, juxta stellas et polum viarum bene doctis."[1] In 1455, however, Cadamosto referred to the height of the pole-star only in terms of a lance-length. The first direct reference to an instrument used at sea was the statement of Diogo Gomes regarding his voyage to Guinea in 1460: "I had a quadrant when I went to those parts, and I wrote the height of the arctic pole on the board of the quadrant." Professor Taylor has suggested that the pilots of those days simply marked place-names on their quadrants where the plumb-line crossed the board; the quadrants were not yet marked in degrees, nor did the charts yet bear latitudes (Fontoura da Costa, 1960, pp. 35–6; 1940*b*, pp. 544–5; Taylor, 1959, pp. 159–61; Peres, 1943, pp. 125–7; Albuquerque, 1960, pp. 15–24; Leite, 1959, pp. 375–410). Such facts only make the achievements of Henry's seamen all the greater; and to Henry must undoubtedly be given the credit of providing both the original and continuing stimulus for navigation and exploration during the long period from 1419 to 1460.

Pedro de Sintra returned to Portugal after the death of Henry from a voyage in which he reached C. Mesurado (lat. 6° 19′ N.). The discoveries to this point since 1446 are well shown on the Benincasa map of 1468, which added fifty-five new names between C. Verde and C. Mesurado (Crone, 1937, pp. 78–84; Academia portuguesa de História, 1948, pp. 74–9, 196–8; Peres, 1943, pp. 109–11; Cortesão, A. 1960, pp. 88–9).

In 1469 Afonso V leased to Fernão Lopes the monopoly of the trade of Guinea for five years, on condition that each year he discovered 100 leagues of coastline, starting from Serra Leoa. This private venture met with outstanding success. In 1471 Pero Escobar and João de Santarem reached the gold-producing area of Shama (long. 1° 38′ W.), and exploration began to pay handsomer dividends. From about this period dates the only fifteenth century Portuguese map to survive (Fontoura da Costa, 1940*c*). Fernão do Pó discovered, probably in 1472, the Ilha Formosa which came later to be called after him, but there is no certainty as to the year when the Ilha de Santo António, later to be known as Principe, was found, or the island of S. Tomé; or when Lopo Gonçalves discovered the cape which was named after him, or Rui de Sequeira, the Cabo de Santa Catarina (lat. 1° 53′ S.). The last was certainly not later than 1475, when the explorations financed by Gomes, which had been extended for one year, ceased. Gomes had inspired the exploration of a greater length of coastline in six years than Henry in forty. The difference was accounted for largely by the incentive of gold. The wealth of the region intensified Castilian claims to Guinea, but Portugal insisted firmly on a doctrine of *mare clausum* (Pacheco Pereira, 1937, pp. 99–129, Kimble trans. pp. 103–38; Blake, 1942).

João II, who had been entrusted with the direction of Guinea affairs in 1474,

[1] "Skilled astronomers, well versed in the stars and in the ways of the Poles."

succeeded to the throne in 1481. He promptly ordered a fortress to be built at Mina (long. 1° 20′ W.). With increased traffic to and from the Guinea coast, improvement in navigational aids became urgent. Diogo de Azambuja took an astrolabe with him when he went to Mina. Zacuto worked out declination tables for 1483 or 1484, while in 1485 the King sent José Vizinho to the Guinea coast to verify various latitudes (Fontoura da Costa, 1960, pp. 67–9, 1940*a*, pp. 548–9; Albuquerque, 1960, p. 9).

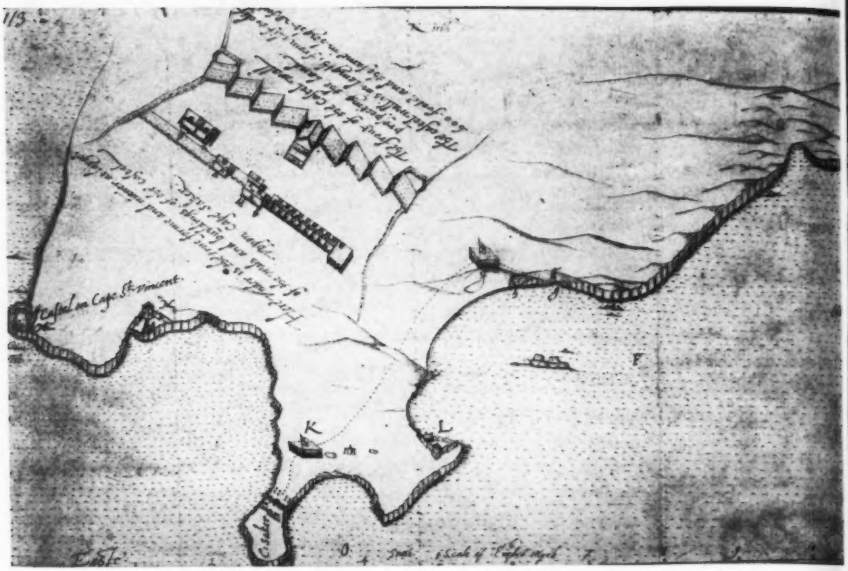
João II did not content himself with the rich trade of Mina; he planned to explore to India. In the middle of 1482 he sent out Diogo Cão. Cão took with him several *padrões*, carved from Portuguese limestone, which carried the arms of Portugal and an inscription which advertised Portuguese priority in discovery and asserted Portuguese rights; they were surmounted by crosses as symbols of Christian domination. The first of these *padrões* Cão raised on the southern point at the mouth of the Congo. The lower part of the circular shaft, the only fragment to survive, was taken to Lisbon in 1859; it is in the Sociedade de Geografia of Lisbon. His second he erected on the Cabo do Lobo, the modern Santa Maria (lat. 13° 26′ S.). This *padrão* was taken to Lisbon in 1892, and the deciphering of the inscription by Luciano Cordeiro resolved doubts about the number and date of the Cão voyages. The inscription read: "In the year 6681 of the creation of the world and 1482 of the birth of our Lord Jesus Christ, the very high, very excellent and powerful prince King João II of Portugal ordered this land to be discovered and these padrões to be placed by Diogo Cão, esquire of his house." Cão, seeing a great expanse of water stretching to the east (later called the Bahia de João de Lisboa, and still later Lucira Grande) was apparently under the delusion that he had rounded Africa, judging by remarks made by Fernandes de Lucena in his Oration of Obedience of D. João II to Innocence VII in Rome in 1485: "Quippe cum emerso jam multo maximo Africae ambitu prope Prassum promontorium, unde Arabicus incipit sinus, superiori anno nostri appulerunt; flumina, littora, portusque amnes perscrutati, quae ab Olisippone supra quinqies et quadragies centena passuum millia ceetissima maris terrarum ac siderum observatione numerantur."[1] Cão returned to Lisbon in April 1484 to be rewarded and ennobled (Cordeiro, 1892; Fontoura da Costa, 1935, pp. 14–18, 22–3, 49–50; Peres, 1943, pp. 181–4, 188–96). His discoveries were recorded on the Soligo maps, now in the British Museum (Egerton 73, fol. 33) (Cortesão, A. 1960, p. 93).

Cão set out again in the autumn of 1485. He sailed up the Congo to return hostages taken during the previous voyage, and at Yelala, near Matadi, members of his crew inscribed on some rocks a record of their visit. On C. Negro (lat. 15° 42′ S.) he erected another *padrão* which was also taken to Lisbon in 1892, but its inscription was illegible. His last pillar Cão erected at Cape Cross (lat. 21° 47′ S.). Still in an excellent state of preservation, it was taken aboard a German cruiser in 1893, and is now in the Museum of the Institut für Physikalische Hydrographie in East Berlin (Rohr, 1956, pp. 43–6). In 1953 I examined a low mound of rock and sand, its centre 33 feet north-west of the replica erected by the Germans in 1895 on Cape Cross; down the middle was a socket of sand and small stones. The mound, when sieved, yielded over a hundred chips of Portuguese limestone.

The exploration continued as far as Serra Parda, where Cão probably died. A legend on the Martellus map, *c.* 1489 (B.M. Add. MS. 15760, fol. 68v.–69) ends:

[1] "After the emergence of far the greatest orbit of Africa, our forebears in an earlier year named the promontory near Prassus, from where the Arabian Gulf begins; so that after a careful examination, the rivers, shores, harbours and streams, which are more than fifty and forty times a hundred miles each from Olisippo(n), are enumerated by observation of the world's oceans and of the stars."

The West African coast, from a chart by Andrea Bianco, 1448, in the Biblioteca Ambrosiana, Milan



By permission of the Trustees of the British Museum

Plan of the promontory of Sagres, drawn by an English hand, May 1587 (Cotton MS. Aug. I. ii. 113)

Portuguese State Office

The promontory of Sagres

"Serram Pardam quae distat ab monte nigro mille miliarum et hic moritur."[1] Argument has raged since 1876 as to whether it was Cão or the Serra that died (summarized in Peres, 1957, pp. 21–4). A. C. da Silva Castro Junior, at the Congresso Internacional da História dos Descobrimentos in 1960 (*Resumo das Comunicaçoes*, pp. 28–32), favoured Cão's death. There are no subsequent references to Cão in the records of the time; the Spanish delegates to the Badajoz conference, 1524, mentioned his death at Serra Parda; and there is no range south of Cape Cross that "dies". The legend on the Coppo map, 1520, is unacceptable (quoted in Almagià, 1951, pp. 48–50).

Bartolomeu Dias took with him similar *padrões*, for the remains of which I have searched on various occasions. Dias sailed from the Tagus in the middle of 1487. He left a store-ship in the Angra das Voltas, the later Lüderitz Bay (lat. 26° 39′ S.) (Coutinho, 1955, pp. 399–401). Then, so far from being carried southwards in a storm as the sixteenth century chroniclers would have us believe, he probably tired of beating against the prevailing southerly winds, and deliberately set a course out to sea (Coutinho, 1951, I, 230). Eventually he steered east and found no land; he steered north, and saw the coast a short distance west of the watering place of S. Bras, the later Mossel Bay. It was probably in the Bahia da Lagoa, a name which became corrupted to Algoa Bay, that the crews became restive. The two caravels turned at the Infante River, which was the Great Fish or the Keiskama (Axelson, 1940, pp. 169–71; Huth). At the first opportunity the expedition raised a *padrão*, dedicated to S. Gregório, probably on 12 March 1488. Fragments of this were found in 1938, and the reconstructed *padrão* stands today in the library of the institution responsible for its recovery, the University of the Witwatersrand.

Sixteenth century chronicles described this *padrão* as being on an island, 5 leagues west of the Ilhéus Chãos, the Bird Islands at the eastern end of Algoa Bay. Pacheco Pereira described it as being on an islet, half a league from low sand dunes, 5 leagues east of the Chãos. The rutter of João de Lisboa, written in about 1514, gave this as its distance east of the Chãos, and added that the islet only looked like an islet from out to sea; it was really linked to the mainland by half a league of sand and sand dunes. Five leagues, $17\frac{1}{2}$ miles, measured off from the Bird Islands on the Admiralty Chart landed squarely on a headland False Island, locally known as Kwaai Hoek. The *Africa Pilot* gave a description of the headland that was almost identical with that of João de Lisboa. On my first visit to the site, in December 1937, I could find no trace of the *padrão*. My brother Charles drove me there the next month, and we started excavating at the crest of the 90-foot high headland. We found fragments of Portuguese limestone, $8\frac{1}{4}$ inches across, and at the foot of the cliff a block of the same width. The University of the Witwatersrand then financed a more thorough search. In February–April 1938 I excavated a hole 60 feet by 30, to a maximum depth at rock bottom of $19\frac{1}{2}$ feet, and made further searches at the base of the cliff, recovering in all some 5000 chips and fragments, including a dozen which carried the remains of an incription; there were also traces of charcoal, lead, iron and glass. The limestone fragments were assembled by Professor C. J. van Riet Lowe, Professor Leo Fouche and Mr. John Harcus. (Axelson, 1938, 1940, pp. 172–81.)

Dias discovered and named the Cape of Good Hope, where he may have erected another *padrão*. The Cantino map shows a *padrão*, but no rutter mentions it. Barros (1778, pp. 190–2) twice referred to it, but elsewhere declared that the

[1] "Serra Parda which lies a thousand miles distant from the Monte Negro and here he [it] dies."

"tempo", meaning the time *or* the weather, made it impossible for Dias to go ashore. I have made several searches for this *padrão*, but without success. Dias returned to the store-ship, and raised another, on either 1 May or 25 July 1488. This pillar was still standing in 1786, when it was sketched by Captain T. B. Thompson of the sloop *Nautilus*, who recorded that the face of the cross was to the westward; on the eastern and western sides was an inscription neatly carved in old Roman characters, but illegible; while at the end of the arm pointing to the south were the arms of Portugal. By 1825 the pillar had been shattered. In 1855 four fragments were taken to Cape Town, where one remained and entered the South African Museum; two were claimed by Portugal, and are in the Sociedade de Geografia

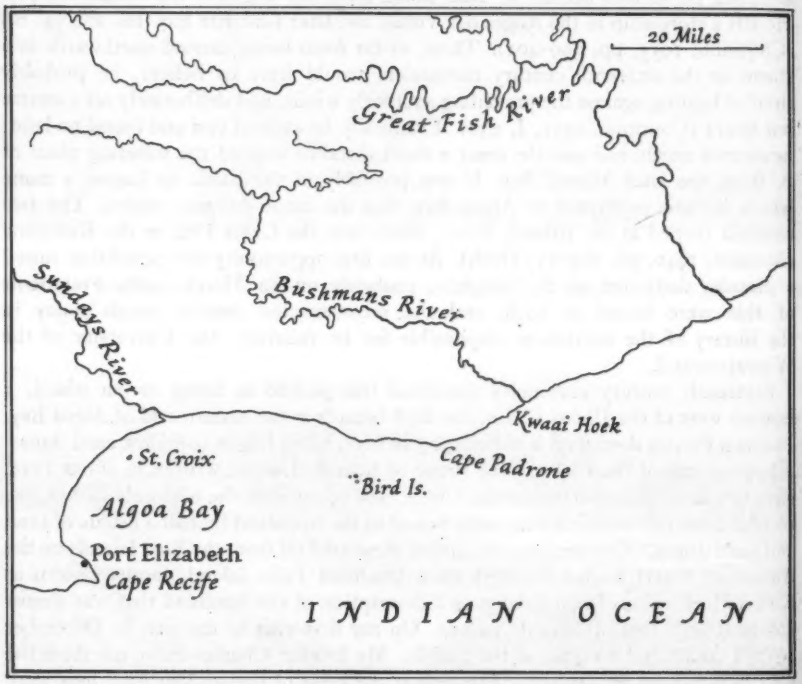


Fig. 2. Site of Bartolomeu Dias's padrão dedicated to S. Gregorio

de Lisboa; the smallest was taken to New Zealand by Sir George Grey and has since been mislaid. In 1955 further fragments were recovered, which are now in Windhoek.

Lüderitz raised a spar on the most likely site, a 55-foot high knoll of black gneiss overlooking the sea, where later a foghorn and commemorative cross were erected. Later there was doubt as to whether the *padrão* might not have been placed on the higher lighthouse ridge several hundred yards to the east. The Historical Monuments' Commission of South-west Africa invited me to look at the two possible sites in 1953. I picked up a piece of Portuguese limestone, $8\frac{1}{4}$ inches across, at the foot of the foghorn knoll, which was confirmed as the site when the next day Dr. C. J. C. Lemmer, the Chairman of the Commission, found a block of the same width carrying the remains of an inscription. Systematic search by Dr. Lemmer, my wife

and myself yielded fragments totalling 120 lbs. in weight. Reconstruction of the *padrão* was interrupted by Dr. Lemmer's untimely death. The sketch by Thompson, a water-colour in a journal in the possession of Mr. Quentin Keynes, gives the *padrão* a very different appearance from those of Cão, and from the Kwaai Hoek reconstruction (Axelson, 1955).

Dias made a greater contribution to the discovery of the sea route to India than any other individual navigator. Not only did he round Africa, but he discovered the method of rounding it, on a wide seaward tack. By the time he had to desist from his exploration the coast was running to the north-east, and the warm current confirmed that he had indeed reached the Indian Ocean.

Pedro de Covilhã penetrated to the Indian Ocean by way of the Mediterranean and the Red Sea. After reconnoitring centres of the spice trade on the west coast of India he crossed to east Africa, and sailed as far as the southernmost Arab port of Sofala. He was forced to remain in Ethiopia, but the information he collected almost certainly reached Portugal (Ficalho, 1898; Beckingham, 1960, pp. 93–5). Less than 14 degrees of latitude remained to be bridged.

Authorities in Portugal awaited news from Covilhã before sending out the next expedition, and the illness and death of João II caused further delay. There is no evidence of any other expedition to the Indian Ocean before that of Vasco da Gama's, but it is probable that there were other explorations to the western Atlantic. It is true that T. A. Chumovsky (1960, p. 42) has a reference to Portuguese ships being overwhelmed on the shoals of Sofala, but there is no indication of date. On page 48 of the same work, the year 900 is obviously a slip and the Vasco da Gama voyage of 1498 is meant, for the second voyage of the Franks is correctly attributed to the year 906 (A.D. 1500–1).[1]

Vasco da Gama followed a course which took him close to the Brazilian coast, and then in a wide sweep to the south-east and east, along a route approximating to that recommended to this day for sailing vessels rounding Africa. His pilot did not recognize the landfall near St. Helena Bay, but calculated that the Cape could not be more than 30 leagues away—which was the exact distance. At Mossel Bay, Vasco da Gama's men raised a *padrão*, which Hottentots overthrew before they had left the anchorage. I have searched for this but found no trace of it. The obvious site would have been where the lighthouse was subsequently erected.

On Christmas Day 1497 the squadron was off the Pondoland coast (probably off Brazen Head and Port St. John's). It called at the Aguada da Boa Gente, and the Rio dos Bõs Sinais. At the latter, usually accepted as being the Quelimane, the Portuguese erected another *padrão*, which rapidly disappeared. My wife and I searched for this in 1951, but found no trace of it, the sea having apparently encroached on the land. This was confirmed by Lieutenant J. A. Barahona Fernandes, who was doing a new survey of the coast; he declared that over half a mile of land at the mouth of the Quelimane had disappeared since 1910. Vasco da Gama's ships visited Moçambique and Mombasa, while at Malindi he was fortunate enough to secure the services of Mādjid, the most distinguished Indian Ocean pilot of his day. At Calicut the Portuguese realized their dream of reaching India. At Calicut they left a *padrão*, and one on St. Mary Island. Returning to Malindi, they cemented their friendship with the sultan, and left another *padrão*. The shaft of this has disappeared, but on the site stands a masonry tower, from the top of which rises a cross of Portuguese limestone, with the Portuguese arms, which may well be part of the original *padrão*. The cross was recently alleged to be of local coral, but in 1959 my wife and I recognized it as being of the familiar Portuguese limestone. The

[1] This sentence was interpolated after Dr. Cortesão had made his remarks (p. 157).

Geological Survey of Kenya confirmed that it was not of local rock, and Serviços Geológicos of Portugal, under D. António de Castello Branco, found, after examining a sample, that the fossils bore a resemblance to those found in Lisbon limestone beds. This cross may well be the only surviving fragment of all the pillars erected by Gama. His last he raised on the islet of S. Jorge, off the island of Moçambique; my wife and I searched for this in 1951, but found the eastern side of the islet of S. Jorge to have been swept clean by cyclones and heavy seas.

The discovery of the sea route to India, with all that implied both to Europe and the East, was the culmination of the nautical effort started by Henry the Navigator. Though we do not accept that he himself had India in mind as a goal, the policy that he helped conceive and execute led inevitably to the Portuguese discovery of western, southern and eastern Africa, the Indian Ocean and India. In was an amazing achievement, especially considering that the population of Portugal through the fifteenth century numbered scarcely a million. Tonight we pay tribute not only to Henry, but to Portugal and the Portuguese.

Acknowledgement.—I wish to thank Mr. R. A. Skelton, Mr. G. R. Crone and Commander A. Teixeira da Mota for assistance in the preparation of this paper, Mr. G. S. Holland for the preparation of the maps and Mr. E. E. T. Day for the projection of the slides. The maps and slides which accompany lectures at the R.G.S. are customarily so perfect that there may be a tendency to take them for granted, and Fellows may not always appreciate the work and experience which have gone into their preparation and presentation by officials of the Society.

BIBLIOGRAPHY

Authorities for Prince Henry's life

J. M. da Silva Marques (1944) published the only known documents (113 in number) mentioning Henry; see also Comissão Executiva das Comemorações do V Centenário da Morte do Infante D. Henrique, *Monumenta Henricina*, 1 vol. (to 1411), Coimbra, 1960, in progress. Recent criticism has established that Zurara's work on Guinea, found in Paris in 1839, published in 1841, and translated into English by the Hakluyt Society in 1899, is really a compilation from two defective texts, one a eulogy of Henry written in 1453, and the other a truer chronicle of Guinea, written between 1460 and 1474 (Dias Dinis, 1959; Zurara, 1899). There is a vast literature on Henry: see Comissão Executiva, etc., *Bibliografia Henriquina*, 2 vols., Lisbon, 1960, which lists 4661 items (not all of which, however, are about Henry and his times). Very useful are A. Fontoura da Costa (1940*a*) and Damião Peres (1943) which remains the standard work on the subject. Refreshing are comments by Duarte Leite (1959), and by V. Magalhães Godinho (1956).

Academia portuguesa de História 1948 *Viagens de Luis de Cadamosto e de Pedro de Sintra.* Lisbon.

Albuquerque, L. Mendonça de 1960 O primeiro guia náutico português e o problema das latitudes na marinha dos seculos XV e XVI. Offprint from *Revista de Universidade Coimbra* **19**.

Almagià, R. 1951 An atlas of Pietro Coppo, 1520. *Imago Mundi* **7**.

Axelson, E. 1938 Discovery of the farthest pillar erected by Bartholomew Dias. *S. Afr. J. Sci.* **35**.

—— 1940 *South East Africa* 1488–1530.

—— 1955 O padrão da Angra das Voltas. *Bol. Soc. Geogr. Lisb.* **73**.

Barros, João de 1778 *Da Asia* I, 1, Lisbon.

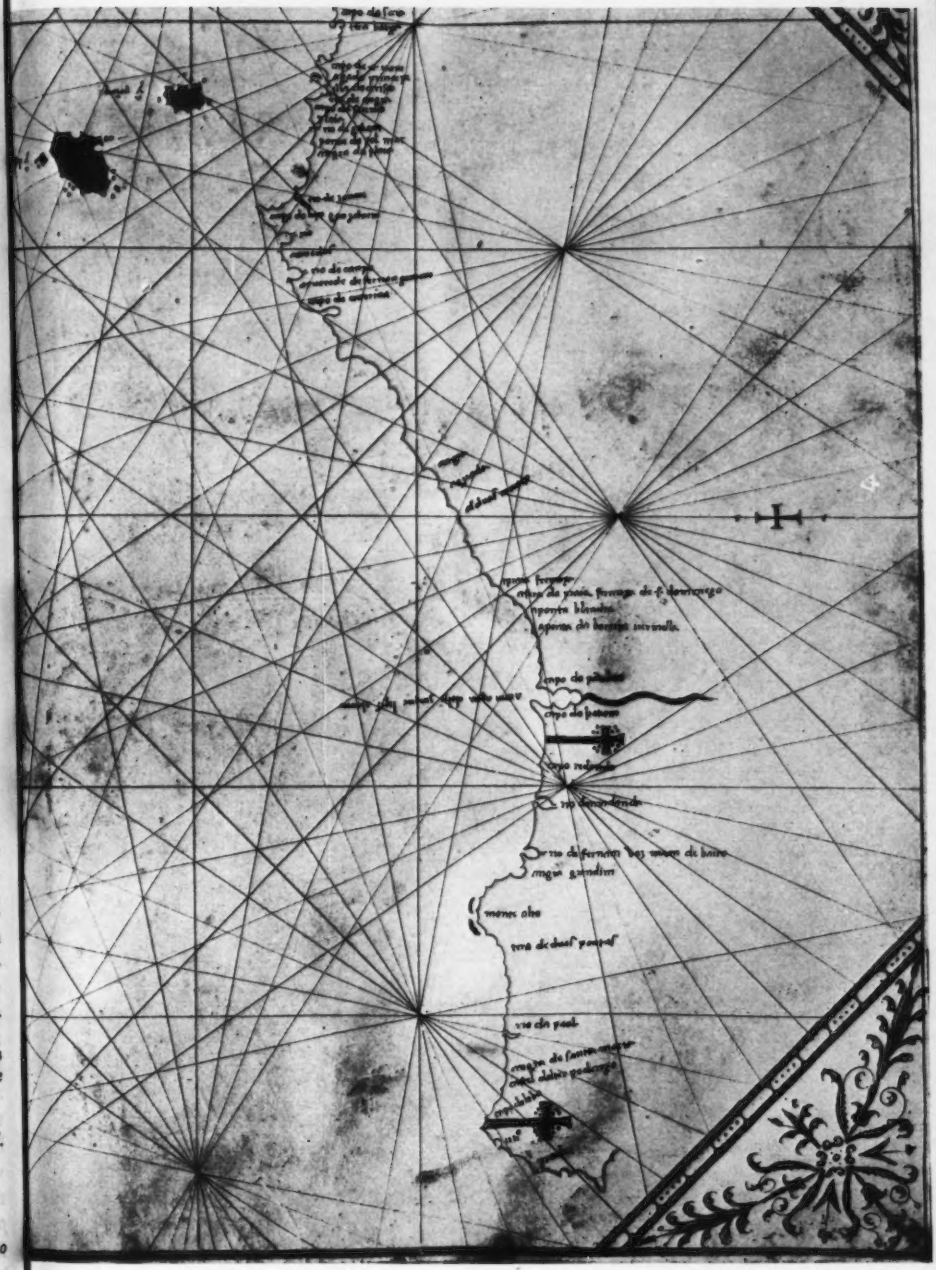
Beckingham, C. F. 1960 The travels of Pero da Covilhã and their significance. *Congresso Internacional de História dos Descobrimentos: Resumo.*

Blake, J. W. 1942 *Europeans in West Africa*, 1450–1560. 2 vols. Hakluyt Society, ser. 2, vols. 86 and 87.

Bovill, E. 1933 *Caravans of the old Sahara.*

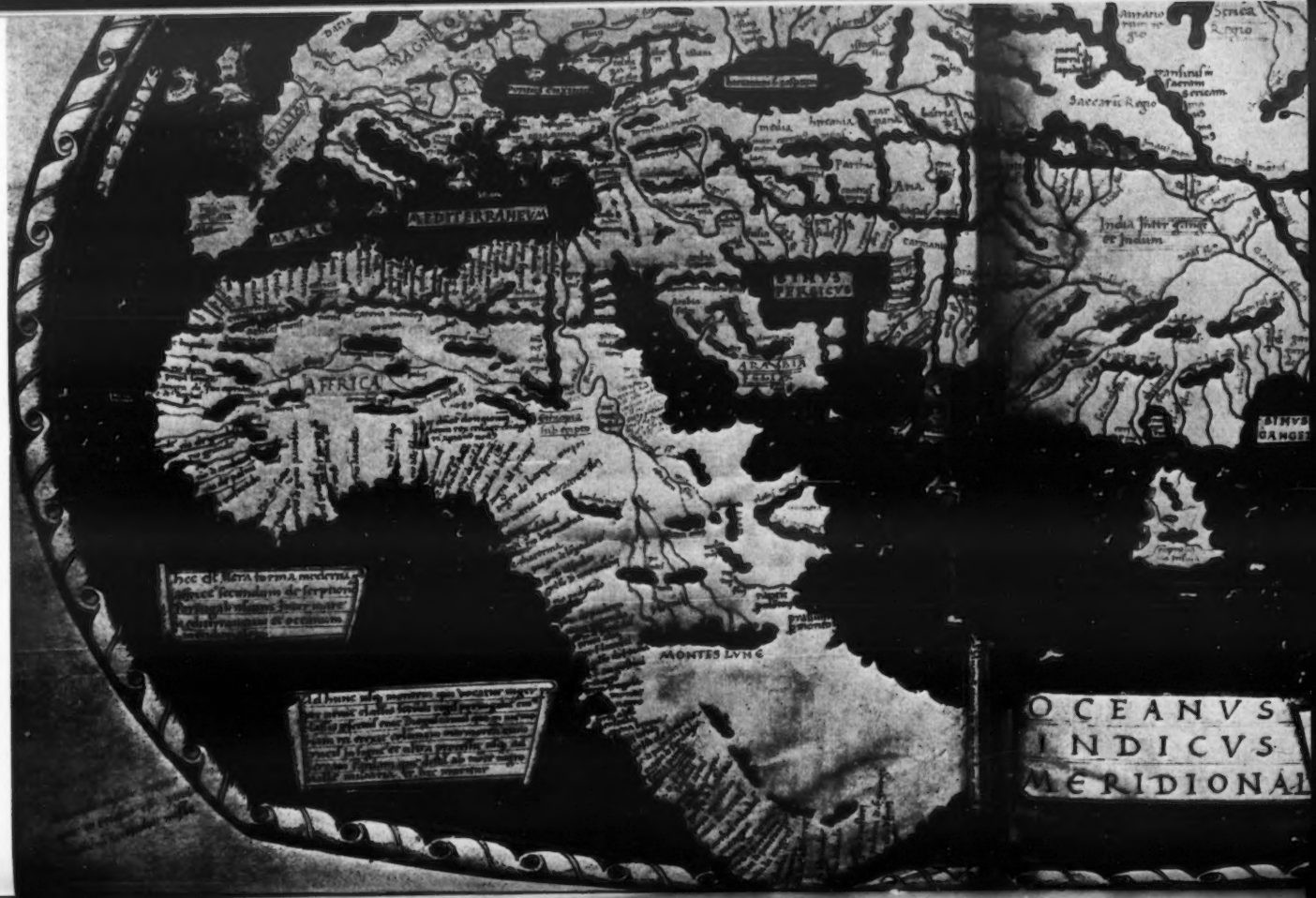
—— 1958 *The golden trade of the Moors.*

Chumovsky, T. A. 1960 *Tres roteiros desconhecidos de Aḥmad ibn Mādjid.* Lisbon.



By permission of the Trustees of the British Museum

The west coast of Africa from the Cameroons to Cape Santa Maria; the southernmost section 'Ginea Portugalexe', copied in a Venetian atlas, c. 1489 (BM. Egerton MS. 73, No. 33)



Part of the World Map of Henricus Martellus Germanus, in his 'Insularium illustratum', Florence, c. 1489 (Add. MS. 15760, ff. 68v–69)

By permission of the Trustees of the British Museum

Cordeiro, Luciano. 1892 *Descobertas e descobridores: Diogo Cão.* Lisbon.
Cordeiro de Sousa, J. M. 1940 O Infante D. Henrique e os primeiros descobrimentos marítimos. *Congresso do Mundo Português*, III.
Cortesão, Armando 1960 *Cartografia portuguesa antiga.* Lisbon.
Cortesão, Jaime 1940 Teoria geral dos descobrimentos portugueses. *Congresso do Mundo Português*, III.
—— 1960–1 *Os descobrimentos portugueses.* 2 vols. Lisbon.
Coutinho, Admiral Gago. 1951 *A nàutica dos descobrimentos*, Lisbon.
—— 1955 *Bol. Soc. Geogr Lisboa* 73, 399–400.
Coutinho does not accept the identification of Lüderitz Bay, but it is the only bay on the coast to answer Pacheco Pereira's description; the latitude is an error in transcription (p. 140; Kimble trans. p. 151).
Crone, G. R. 1937 *The voyages of Cadamosto.* Hakluyt Society, ser. 2, vol. 80.
Dias Dinis, A. J. 1959*a* *Vida e obras de Gomes Eanes de Zurara.* Lisbon.
—— 1959*b* *Crónica dos feitos de Guiné.* Lisbon.
Ficalho, Conde de 1898 *Viagens de Pedro da Covilhan.* Lisbon.
Fontoura da Costa, A. 1935 As portas da India em 1484. Off-print from *Anais do Club Militar Naval.*
—— 1940*a* Descobrimentos portugueses no Atlântico e na costa ocidental africana do Bojador ao Cabo de Catarina: *Congresso do Mundo Português*, III. Lisbon.
—— 1940*b* Ciência nàutica portuguesa: cartografia e cartografos: *Congresso do Mundo Português*, III. Lisbon.
—— 1940*c* *Uma carta nàutica portuguesa anónima de circa* 1471. Lisbon.
—— 1960 *Marinha dos descobrimentos.* 3rd edition, Lisbon.
Godinho, V. Magalhães 1956 *Documentos sôbre a expansão portuguesa.* 3 vols. Lisbon.
Gomes, A. Sousa 1940 A *vila* do Infante e a Escola Nàutica. *Congresso do Mundo Português*, III. Lisbon.
Gonçalves, Julio 1955 *O Infante D. Pedro, as* Sete Partidas *e a genese dos descobrimentos.* Lisbon.
Huth, E. F. A. Unpublished monograph: *The Rio Infante of Bartolomeu Dias*, in which the Infante River is identified as the Bashee.
Leite, Duarte 1959 *História dos descobrimentos*, I. Lisbon
Malpique, Cruz n.d. A nàutica do Infante, offprint from *Boletim da Biblioteca Pública Municipal de Matosinhos*, No. 7.
Mauny, R. 1960 *Les navigations médiévales sur les côtes sahariennes antérieures à la découverte portugaise* (1434). Lisbon.
Pacheco Pereira, Duarte 1937 *Esmeraldo de Situ Orbis*, Lisbon; trans. by G. Kimble and published by the Hakluyt Society, ser. 2, vol. 79.
Peres, Damião 1943 *História dos descobrimentos portugueses.* Oporto.
—— 1957 *Diogo Cão.* Lisbon.
Rohr, A. 1956 Portugiesiche Wappenpfeiler des Entdeckungszeitalters. *Marine Rundschau*, 2.
Silva Castro, A. C. da 1960 in *Resumo das Comunicações*, Congresso Internacional de História dos Descobrimentos. Lisbon.
Silva Marques, J. M. da 1944 *Descobrimentos portugueses*, I (1147–1460) and *Supplemento* (1057–1460), Lisbon. Documents 27/10/1443 and 19/9/1460.
Soares, Ernest 1959 *Iconografia do Infante D. Henrique*, Lisbon.
Taylor, E. G. R. 1927 Pactolus: river of gold. *Scot. geogr. Mag.* 44.
—— 1956 *The haven-finding art.*
Zurara, Gomes Eanes de 1899 *The chronicle of the discovery and conquest of Guinea.* Translated by C. R. Beazley and E. Prestage, and published by the Hakluyt Society, Vol. 1: ser. 1, vol. 100; Vol. 2: ser. 2, vol. 2.

DISCUSSION

Evening Meeting, 17 October 1960

The PRESIDENT (Lord NATHAN): This is an unusual, indeed, in its way, a unique occasion. There have recently been two unusual celebrations: one in Stockholm, the 19th International Congress of Geography; the other in Lisbon, which was attended on behalf of the Society by General Sir James Marshall-Cornwall, for the quincentenary of Prince Henry the Navigator. The International Geographical Congress

15760, ff. 68v–69)
By permission of the Trustees of the British Museum

takes place every four years; the celebration of Prince Henry only every 500. Today represents our small part at the Royal Geographical Society in paying a tribute to that great historical figure. I am glad to think that the lecture is to be given by Dr. Axelson of the Witwatersrand University in South Africa, who holds a Gulbenkian Foundation Fellowship and is now in Lisbon making studies of various aspects of Portuguese history, in particular those associated with African discovery and the sea route to India. This memorable occasion is honoured by the presence of His Excellency the Portuguese Ambassador, and by Senhora Pinto, and we also have here Dr. Armando Cortesão who was here only a few months ago to receive the Society's Victoria Medal, one of the highest we can award. Dr. Cortesão has been responsible for a most distinguished work of cartography: the *Portugaliae Monumenta Cartographica*. If you go into the Museum after this lecture you will see the two volumes displayed there; they are marvels of cartographic skill and virtuosity and at the same time remarkable examples of the topographical arts of the Portuguese. He is here today as the official representative of the Portuguese Government's Commission in connection with the quincentenary celebrations.

This lecture is the first of a series of lectures founded in honour of a most distinguished woman, Professor Eva Taylor, and after the lecture she is going to add her postscript. Two or three years ago, it was suggested that Professor Taylor's career was one of such distinction that it should be marked in a special public way, and that a convenient opportunity of doing so would be her 80th birthday. The result of this idea has been the founding of the "Eva G. R. Taylor Fund" to provide a lecture in her name, and this is the first Eva G. R. Taylor lecture. She herself has been for nearly half a century a Fellow of this Society. She has not merely had a great reputation at Oxford, but an even greater one at the University of London, where she has done so much for so long. I now call on Dr. Axelson to give you his address on Prince Henry the Navigator and the sea route to India.

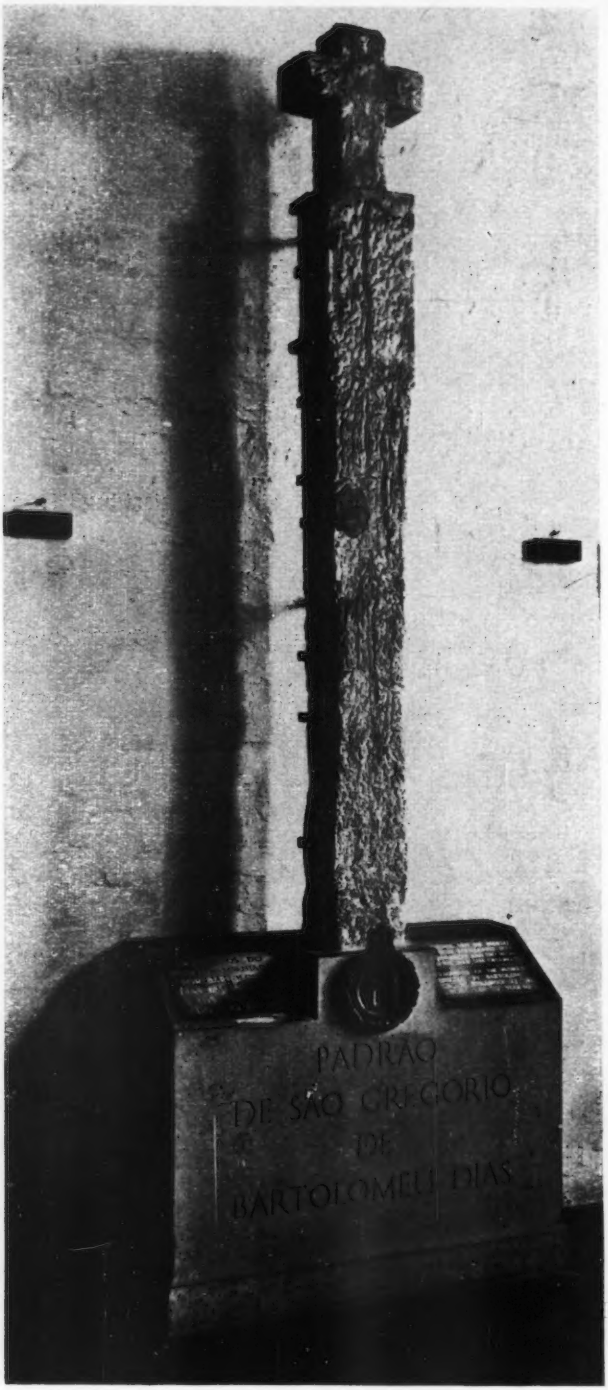
Dr. Axelson then read his paper

Professor EVA TAYLOR: You all know the story of the ghost who would sit down at his funeral feast, to the embarrassment of all the other guests. Usually these named lectures are memorial lectures, but this one is only a memorial in anticipation, so it gives me an opportunity to thank those friends who contributed to this birthday present (for it was a birthday present) and made it possible for me to hear this lecture. I cannot name them all—there were five different bodies which took part. I also want to thank whoever it was who thought how pleasant it would be to have as a subject for the lecture Prince Henry the Navigator, with whom I have been associated by being also falsely called a navigator! I want, too, to thank our lecturer warmly for giving us such a fascinating story, not only of the voyage round Africa, but of his discoveries of the remains of the Portuguese crosses.

Prince Henry was, of course, nicknamed "the Navigator" by the English, which was rather unfortunate, because he never navigated at all, he merely crossed to Ceuta. As for myself, I am absolutely terrified of the water and would not go on it for anything! But the Portuguese have not been sufficiently proud of their Prince Henry; they celebrate him only every 500 years. Consequently you have all this nonsense about Christopher Columbus; you know what you learn at school, that Columbus was such a wonderful navigator. Well, his early sea experience was only that of a cargo supervisor, a purser, his qualities were not those of a navigator and he could not have made any discovery had it not been for the Portuguese. The Portuguese were the initiators of the Great Age of Discovery, although they have been too modest about it, with the result that all we hear about is this marvellous sailor Columbus. What Columbus did was to consult a Portuguese manual. When discussing him people say "Yes, oh yes, he made this and that observation, and of course they are very faulty, but that is some copyist's error", and they talk it all away. But, in fact, he took a Portuguese manual in his hand which he could not quite understand, and if you take one of these old manuals and go through Columbus's mistakes you understand exactly how he made them. I

Inscription recording the visit of Diogo Cão, at the head of the Congo estuary

Photograph by Michael Teague



By permission of the University of the Witwatersrand

The padrão set up by Bartolomeu Dias near False Island, South-east Africa

don't want to decry Columbus. He had the same qualities as Prince Henry, which were not those of a navigator, but those of having tremendous drive and imagination to push a project through.

We have all heard of one difficulty in first crossing the Atlantic—sailors hated to go where there was a wind in one direction but not in the other. In the Indian Ocean one could go to and fro with the Monsoon, but in the Atlantic you had those frightening Trades; "How are we going to get home?" they said. Columbus's force of character was such that he made them go on westward. He falsified the log, for he knew, not from his own knowledge of seafaring, but from the pioneer work of the Portuguese what he was doing. The Portuguese, long established in the Açores, knew that while the North-east Trades take you out, there are Westerlies, in the latitude of the Açores, which bring you back. But I must not give you another lecture on navigation.

There was a cutting jest, by the way, made by the Spaniards against the English. In those days, before Prince Henry (or rather those who worked for him) had established navigation by latitude, our way of navigating was simply by lead-and-line—as, of course, inshore it still is. The Spaniards, on the other hand, took over Portuguese methods and a Spanish nobleman, a prisoner on board an English ship, once said: "Of course, you English always look down below, and the Evil One down there helps you; we look up into the skies (taking the height of the stars), and the Queen of Heaven helps us!" Well, I said I would not give you a lecture on navigation; I must not do so, and I will step down for the next speaker. But again may I take this opportunity of thanking Dr. Axelson for his lecture.

Dr. Armando Cortesão: My Lord, I should like to thank you for your most generous words. I believe that when the Royal Geographical Society bestowed that Victoria Medal upon me, which I treasure as a very high distinction, this venerable Society wished to honour my country, where we are commemorating the quincentenary of Prince Henry the Navigator.

Dr. Axelson was kind enough to challenge me by name to correct what he said. This is rather difficult for me, because I wonder whether there are many Portuguese historians who know as much of the history of the discoveries, particularly the history of the discovery of Africa south of the Equator, as he does. How could I therefore correct what he has so brilliantly said? Nevertheless, I venture to add a few words which may help to explain some facts to which Dr. Axelson has referred. There are gaps in the records of history which the historian must try to fill, but which cannot be filled with documents only. We know of those gaps because we are aware of some historical facts which imply other facts that cannot be found concretely recorded in documents. One such fact, mentioned by Dr. Axelson, refers to the first voyage of Vasco da Gama to India, when that great sea captain sailed from the Cape Verde Islands, almost reached the coast of Brazil, and then turned south-east and doubled the Cape of Good Hope, following almost exactly the course still taken by modern sailing ships. This extraordinary performance implies two facts, pointed out by several Portuguese historians of nautical science, but which are not recorded in any document: in the first place, Vasco da Gama knew of the system of winds and currents in the Central Atlantic, which means that, besides the well-known voyages of Diogo Cão and Bartolomeu Dias, there were other earlier exploratory voyages in that region; secondly, that the Portuguese navigators knew by then how to determine astronomical latitudes at sea. There is much indirect and conjectural evidence for such unknown exploratory and preparatory voyages, which is gradually being confirmed by more concrete evidence. I should like to mention two cases only which, I think, are more impressive. A rutter of the remarkable Arab pilot Ibn Mādjid, who guided Vasco da Gama from Malindi to Calicut, was recently discovered in Leningrad, in which he refers, in precise terms, to the wreck of a Portuguese ship that in 1495 (therefore two years before he met Vasco da Gama) visited the east coasts of Africa.[1] No other known document mentions this voyage. Vasco da Gama was undoubtedly a great and experienced sailor, but no document refers to any voyage of his before he went to India, although he must

[1] But see p. 153 above.—*Ed. G.J.*

have often been to sea. It has been suggested, and I think it quite possible, that he commanded the ships referred to by Ibn Mādjid.

Another is the case of the nautical chart of 1424. We have had for a long time several indications, documentary and otherwise, that from an early date Prince Henry sent caravels to probe much further westwards in the Atlantic than the documents explicitly say, and many historians have stated their convictions that American lands were reached from Europe much earlier than the last decade of the fifteenth century. That chart dated 1424 which, although Venetian, was drawn from a Portuguese prototype shows for the first time in the westernmost Atlantic a group of large islands which I am convinced represent the Antilles. I have written a large monograph about this chart, published by the University of Coimbra in 1954. There is still much to investigate, study, discuss and learn before we can draw a clearer picture of that great period of early geographical discoveries, particularly in the fifteenth century, so important for the history of mankind. I am very happy to have heard Dr. Axelson tell us about his researches and experiences on this subject of the pillars of the discoveries, a subject on which he certainly is the greatest authority.

I should like to add one more word. I was sent here as a representative of the Executive Commission of the Commemoration of the quincentenary of the death of Prince Henry the Navigator, and in that capacity I want to express to you personally, my Lord, as the President of the Royal Geographical Society and, in your person, to this great and friendly country, the appreciation of all Portuguese for your noble contribution to this commemoration: bestowing upon me the great honour of your Victoria Gold Medal, for having invited such a distinguished scholar as Dr. Axelson to deliver this Eva Taylor lecture on a subject of such importance for the history of Portuguese discoveries, and last, but not least, for the wonderful exhibition now to be seen at the British Museum.

Sir ALAN BURNS: I am very grateful for the opportunity which has been given me as President of the Hakluyt Society, to join in the tributes to the memory of Prince Henry the Navigator, and to thank Dr. Axelson for his very interesting lecture. Richard Hakluyt himself did not refer to Prince Henry because he was interested only in the principal navigations of the English peoples, but he did refer in one part of his book to "those large countries and islands the Portuguese with their small numbers had discovered, peopled and planted," and in other places also he paid tribute to their great exploring initiative. The Hakluyt Society, on the other hand, has made available to English readers a number of the original documents illustrating the Portuguese discoveries. The principal one of these, of course, is the chronicle of Zurara. R. H. Major, who wrote the first English biography of Prince Henry, and I believe applied the epithet of "the Navigator," was for ten years the Honorary Secretary of the Hakluyt Society. And I think it is appropriate to mention that Professor Taylor, after whom these lectures are named, is a Vice-President of that Society and has already published five books under its imprint. We are looking for a sixth from her this year. No one who has lived for many years in West Africa, as I have done, who has travelled along the coast explored by Prince Henry's captains, could fail to be interested in anything to do with this great leader. Nigeria and Ghana, with which I am well acquainted, were not reached during his lifetime, but everywhere along that coast you find evidences of Portuguese influence and culture; in the famous brasses of Benin, in the name of the chief town of Nigeria, Lagos, and in the numerous castles along the Ghana coast, especially in the great castle of Elmina, which was built in 1482. May I conclude, Sir, by thanking our speaker for a most interesting lecture.

GEOGRAPHY AND GEOGRAPHERS IN THE SOVIET UNION

R. A. FRENCH

IN THE SOVIET UNION, geography holds a high status as an academic and practical discipline. The geographical tradition is long and honoured; it included such eminent exponents as P. P. Semënov Tyan-Shanskiy and N. M. Przheval'skiy, both Honorary Fellows of the Royal Geographical Society. The All-Union Geographical Society has been in existence for over a hundred years and, since its very founding, has had many links with the R.G.S. As early as the eighteenth century, M. B. Lomonosov, scientist and founder of Moscow University, enthusiastically advocated the study of geography and the Faculty of Geography at Moscow annually commemorates his interest in a series of papers, known as the Lomonosov Studies. Moreover, the Revolution, although it brought many new ideas and approaches to the subject, did not cause a break in this geographical tradition. Many outstanding figures, such as V. P. Semënov Tyan-Shanskiy, L. S. Berg and V. A. Obruchev, continued their research and teaching, long after 1917.

Perhaps the clearest way to comprehend the framework of Soviet geographical instruction and investigation is to follow the career of a Soviet geographer. The schools which prepare for university are, at present, mostly ten-year schools, although this period is now being extended to eleven years under the recent reform of education. Under this new syllabus, children do no geography for the first three years, while in the fourth year it is combined with nature study. The fifth to eighth classes do two hours of physical geography a week, the ninth class none, the tenth and eleventh two hours a week of economic geography. Soviet geographers are much concerned that, under the new scheme, the number of hours devoted to the subject in schools has been appreciably decreased, together with the abolition of examinations in geography, and the introduction of textbooks felt to be inferior to those previously in use. On the credit side, there is strong emphasis in the schools on practical work and pupils are encouraged to carry out local studies, make relief models, take meteorological recordings and the like.

On leaving school, the intending geographer must now undertake two years' employment and then may enter either a pedagogic institute (or Teachers' Training College) or a university. There are sixty-two pedagogic institutes with departments of geography, while of the forty universities, thirty have faculties of geography, either independent or in combination with geology or biology. By far the largest university and largest faculty of geography are at Moscow. The Faculty has over 1000 full-time students and 800 evening and external students, while the staff number over 300. The facilities it enjoys are enviable. It is located in the new university on the Lenin Hills, where six floors of the central block of the giant skyscraper are given over to the Faculty for lecture rooms, laboratories and staff rooms. Here, too, is a section of the Gorkiy University Library, with a large collection of geographical material, including a limited selection of Western books and periodicals. The library's value is increased by its ability to borrow books from the Lenin Library. Apart from the Faculty, in the same building eight floors are devoted to a Museum of Earth Sciences, that is, geography and geology. Together with divisions for mineralogy, stratigraphy and pedology, there is one floor, consisting of a series of displays for every region of the U.S.S.R., in which the whole complex of the

physical geography is shown by relief models, geological sections, soil profiles, examples of the fauna and flora and innumerable illustrations in the form of maps, diagrams and photographs. The exhibition provides an excellent introduction to the wide range of landscapes in the Soviet Union.

Work in the Moscow Faculty is carried on in fifteen *kafedry*, or departments. The list of these is an instructive indication of the emphasis in Soviet geographical teaching: (1) General geographical science; (2) Geomorphology; (3) Hydrology of the land; (4) Soil geography; (5) Climatology and meteorology; (6) Biogeography; (7) Oceanography; (8) Cartography; (9) Physical geography of the U.S.S.R.; (10) Physical geography of foreign countries; (11) Economic geography of the U.S.S.R.; (12) Economic geography of the Peoples' Democracies; (13) Economic geography of capitalist countries; (14) Geography of the Arctic and Antarctic; (15) History of geography. The heavy stress on the physical aspects of the subject is readily apparent.

Students follow a five-year course, the first two of which are comparable to the sixth form of British schools. There is a much wider range of subsidiary subjects than in British universities, including geology, physics, chemistry, mathematics, Marxist philosophy and political economy and a foreign language. English is the most usual choice. In geography, all students take basic courses in geomorphology, climatology and meteorology, biogeography, soil geography and the physical and economic geography of the Soviet Union. In the third year, the student commences a number of advanced courses, relating to the field of his *kafedra*. For example, students in the *kafedra* of economic geography of the U.S.S.R. follow courses in statistics, in industrial, agricultural and urban geography, in demography and in economic regionalization. In the final year, all students are required to prepare and defend a dissertation. Throughout the five years, the lecture load, with two-hour periods, is very heavy. In addition, there is compulsory military training.

A very marked feature of the course is the weight given to practical aspects. Much time is spent in the laboratories, of which there are fifteen, very well equipped.[1] Even more time is devoted to field-work, in all, about fifty weeks. In the first two years, field-work is done at the Faculty's station at Krasnovidovo, near Moscow. Students then go to one of the other stations run by the Faculty, in the Kola Peninsula, the Caucasus or the Carpathians. In the latter years of the course, field-work is related to individual specializations. Thus oceanographers work on a marine research vessel, based on Odessa. Others may be attached to research expeditions to carry out surveys of various kinds. In the course of this expeditionary work the student will gather material for his final year dissertation.

The pattern of training at Moscow is followed, if on a smaller scale, at other universities. Leningrad, the second largest with about fifty staff and 500 full-time students, has eight *kafedry* and Riga, with about twelve staff, two—economic and physical.

As a result of this thorough training in the practical side of geography the graduate is very competent to carry out surveys in his special fields, usually better able to do so than his British counterpart. For three years after graduation the student is required to work where his services are needed by the interests of the state and it is probable that this will involve continued surveying, either with a scientific expedition or in connection with a government project, or to compile soil maps to assist

[1] The laboratories are for snow and ice, palaeo-geography, landscape study, geochemistry of landscapes, soils, geomorphology, hydrology and hydro-chemistry, special cartography, geodesy and cartography, photogrammetry, aerial photography methods and map publishing, together with an observatory, herbarium and map store.

collective and state farm managements. The best students, naturally, remain at the university for higher qualifications, spending three years as *aspiranty* and preparing a dissertation for the degree of Candidate in Geographical Sciences. Many of these dissertations are concerned with the application of geography to the development of the national economy and planning.

About half those who have attained the degree of Candidate go to teach in higher educational establishments. Others go to various scientific research institutions or to research sections of ministries and state organizations. GOSPLAN, the supreme planning authority, employs many geographers, so do the Hydro-Meteorological Service, the Ministry of Agriculture and the Chief Directorate of Geodesy and Cartography. Most highly coveted are posts in the Institute of Geography of the Academy of Sciences.

This Institute, of which Academician I. P. Gerasimov is the Director, is the major research body in the U.S.S.R. It is staffed by over 300 geographers, working in ten divisions.[1] One of its most important functions is to investigate research problems set by the government, in particular by GOSPLAN. No less important is the organization of multilateral field expeditions, often in conjunction with the universities or with other Institutes of the Academy of Sciences. In such cases, it is frequently a geographer who heads the expedition, as the person best able to coordinate the research. These expeditions and the publication of their results are among the most valuable achievements of Soviet geography. Together with its many research projects, the Institute carries out a large publishing programme. There is a branch of the Institute in Irkutsk, under Professor V. B. Sochava, concerned with problems of Siberia and the Far East.

The most important organization for coordinating research is the All-Union Geographical Society. It has its headquarters in Leningrad, where it maintains a very fine library of over 300,000 books and a map collection. Its archives include the private collections and manuscripts of many of the eminent Russian geographers of the past. Membership of the Society is 9960, almost all of whom are professional geographers. The Society has 124 branches and sub-branches in the various republics and towns of the U.S.S.R., some of which are very large. Moscow has over 1500 members, the Leningrad and Georgian Republic branches over 1000. Even Sakhalin can boast of more than 300 active members. The work of the branches is carried on in sections devoted to the different aspects of geography. Like the Institute of Geography and the universities, the Society is responsible for organizing scientific expeditions and in the last five years 180 have been mounted. The Society's function in coordinating research throughout the country and in providing progress reports is accomplished by conferences, on a particular region or a particular problem. For example, in November 1959 the Moscow branch held a conference on the problems of satellite towns. Papers presented included detailed studies of satellite towns around Moscow, Leningrad, Kiev and Gorkiy and a well-informed report by V. S. Varlamov on the British new towns. In all, the past five-year period has seen more than sixty such conferences.

By far the most significant meetings are the quinquennial congresses of the Society. The third post-war congress was held in Kiev in February 1960, the previous ones having been in Leningrad in 1947 and Moscow in 1955. There were 1100 members present, of whom 231 were elected delegates, fourteen overseas visitors and about half from Kiev and its neighbourhood. The Congress lasted eight days and its

[1] Physical geography, Geomorphology, Climatology and hydrology, Biogeography, Glaciology, Cartography, Economic geography of the U.S.S.R., Geography of Peoples' Democracies, Geography of capitalist countries and the History of geography.

programme was very heavy. The main sessions took up nine hours a day, from 10 a.m. to 3 p.m. and from 6 to 10 p.m. In addition, there were geographical films, lectures on recent exploration in Antarctica and elsewhere and lectures by Soviet geographers on their visits to foreign countries, including Academician Gerasimov on his 1958 visit to Great Britain.

The chief work of the Congress was organized in six symposia, each devoted to a major research topic. The papers presented were printed and circulated in advance and the authors were then given a brief opportunity to comment on their papers. This was followed by open discussion, lasting in some cases for several days. Finally, sets of resolutions were drawn up, stating the main research tasks to be carried out, proposing steps to fulfil them, setting up sub-committees where necessary, and urging action on official bodies. These symposia represent the most important problems claiming the attention of Soviet geographers and the results of these deliberations will have a strong influence on the direction of work for the next five years.

The first symposium was entitled, 'The role of geography in the study, use, conservation and renewal of natural resources'. Eleven papers were given, the largest number at any symposium. In the end, no less than twenty-six pages of resolutions were drawn up. Great stress was laid on the necessity to map natural resources of all kinds and on methods of doing so. Singled out as requiring special study were forests, natural fodder (i.e. grasslands), surface waters and fauna. It was emphasized in this symposium that natural resources must be studied in relation to each other and that the complex of resources in a given area must be investigated as a whole by multilateral expeditions. This is a task of maximum urgency, as a prerequisite for the drawing up of GOSPLAN'S long-term fifteen–twenty year plan.

Perhaps the most bitter argument occurred in the symposium on 'Economic regionalization of the U.S.S.R.' In connection with the government policy of decentralizing control and giving greater autonomy to the republics and regions in matters of economic development, geographers and others are giving much attention to finding the most rational and efficient division of the country into regions. During the twenty hours' discussion which this symposium provoked it appeared that there were two schools of thought on this problem, although both took as a starting point the GOSPLAN division of the nineteen-twenties. The first opinion, sponsored by Professor P. M. Alampiyev and the Economic Research Institute of GOSPLAN, held that the number of regions should be reduced as the basic manufacturing regions were increasing their national influence. The second view, that of Professor Yu. G. Saushkin and the *Kafedra* of Economic Geography of Moscow University, favoured a considerably greater number of regions, especially in Siberia, to take into account the expected future development of areas, the resources of which have scarcely been tapped to the present.

No less concerned with the application of geography to planning was the symposium on 'Natural (physical-geographical) regionalization for the purposes of agriculture'. Local climate studies and soil surveys figured largely. Soil surveying and mapping is being carried out on a vast scale. On the basis of such maps, agricultural land is evaluated. The large-scale maps produced, of soils, land forms and land quality are made available to farm managements, but unfortunately are not generally accessible.

The fourth symposium had as its theme, 'The general theory and practical application of methods of landscape study'. The term "landscape study", as used by Soviet geographers, is almost entirely restricted to the physical aspects of the landscape, including soils, vegetation and fauna. The part played by Man in creating "cultural landscapes" is considered very little, except where Man has been an agent

in creating land forms, such as erosion gullies. Much of the time of this symposium was taken up by discussion of terminology.

Fifth was a symposium entitled, 'The water-heat regime of the earth's surface'. This is considered one of the most fundamental problems of geography and is attracting a great deal of attention at the present time. Study of the heat–moisture balance of the soil and subsoil is of the utmost importance in analysing hydrological regimes and therefore in investigating questions of gully erosion and forest plantation in drier areas.

The final symposium was devoted to a study of 'The state of geography in middle and higher schools, in connection with the reform of middle and higher education'. It was here that Soviet geographers, as already mentioned, forcibly expressed their dissatisfaction with the treatment received by geography under the new system of education.

In all symposia, regard was paid to the venue of the Congress and special attention given to the Ukraine and its problems. During the discussions, many reports were given of investigations carried out in the smaller regional centres. In general, however, it was clear that the world of Soviet geography is heavily dominated by Moscow (with the Institute of Geography and the University) and Leningrad (with the Geographical Society and Leningrad University). In the elections for the Scientific Council, the supreme executive organ of the Society, thirty-nine of the forty-three elected members were from institutions in Moscow or Leningrad, as well as the President and Vice-Presidents (Academician Ye. N. Pavlovskiy and Academician I. P. Gerasimov and Professor S. V. Kalesnik). On the other hand, the remaining fourteen *ex-officio* members are the presidents of the Republic branches.

A very interesting feature of the Congress was the large and well-displayed exhibition of research and publishing. This included many manuscript maps, produced as the result of field-work—geomorphological, soil, land use and land evaluation maps. All surveys of this type appear to be carried out on a scale of 1:25,000. Unfortunately, the finished maps are not published, although in some cases the information is transferred to small-scale maps. A grave handicap to the publication of survey results and a hindrance to research in general is the classification by the State as secret of all maps of greater scale than 1:500,000. Also on show were proof copies of a large and useful climatological atlas and a detailed regional atlas of Kiev Oblast, the first of what is hoped to be a series of oblast atlases. The exhibition also displayed over 600 books, part of the very considerable volume of geographical publishing in the U.S.S.R. over recent years. This includes a number of translations of Western works, such as *The British Isles*, by L. D. Stamp and S. H. Beaver, *West Africa*, by R. J. Harrison Church and *American geography, inventory and prospect*. The bulk of publication is the responsibility of the Academy of Sciences and the State Publishing House of Geographical Literature. Books published in smaller centres are often in very small editions and difficult to obtain, as are the journals of branches of the Geographical Society. Only *Questions of geography*, produced by the Moscow branch, has a wide circulation.

The papers and discussions of the Kiev Congress emphasized some of the trends in Soviet geographical theory, trends already in evidence in school and university teaching. Above all, one is forcibly impressed by the deep gulf which exists between physical and economic geography. Many Russian geographers, far from deploring this division, approve of the existence of what they call "two scientific disciplines". Numbered amongst these are several influential senior professors, particularly physical geographers. Economic geography is a relative newcomer and is by no means always accepted as an equal. Human and historical geography, both well

developed in Great Britain, do not exist as such, but are included as rather minor aspects of the economic branch. Historical geography has had very little attention and much of that which has been accomplished has been carried out by historians, particularly economic historians. Political geography does not exist at all. Perhaps this dualism in the subject is the result of regarding geography as a pure science and therefore concerned only with phenomena which are governed by scientific laws. A word frequently used by all Soviet geographers is *zakonomernost'*, i.e. conformability to laws. One of the chief arguments advanced to support the physical-economic division is that two differing sets of laws are involved, physical laws and the laws of Marxist economics. Another reason, undoubtedly, for the gulf is that a close integration of economic and physical geography was believed to run the risk of determinism, which until only recently was held to be a grave error of Western geography.

There is, however, a growing and influential body of opinion which regrets the division of geography and seeks to bridge it. Among supporters of this opinion are Professor Saushkin and the Moscow Faculty of Geography. Their view opposes strongly the concept of separate but equal disciplines, but at the same time stresses that this does not mean geography to be monolithic, indivisible. On the contrary, the scope of the subject is so great that it can only be studied in its various specialized branches, but, as this view emphasizes, these specializations are only parts of the whole, of an over-all geographical unity. Therefore all their results must be correlated and integrated in order to give a complete picture of the geographical environment of human society.

An extremely important question is that of contact between British and Soviet geographers. In the U.S.S.R., the keenest interest is displayed in the study of geography in Great Britain. Reasonably extensive knowledge of work in Western countries is largely confined to the two main centres, Moscow and Leningrad, but even here there are many surprising gaps in knowledge and in library collections. Thus in the economic geography of Great Britain, the book of Professors Stamp and Beaver is universally known, that of Professor W. Smith is almost unknown. Although many Soviet geographers have at least a reading knowledge of English, it is often difficult, outside the two main cities, to obtain Western works. Part of the difficulty in provincial centres is that all official book exchanges have to be canalized through the library of the Academy of Sciences in Leningrad. In these smaller centres, it is felt that this involves much administrative difficulty and delay. The arrangement of personal exchanges was preferred as an alternative. As well as the wish for book exchanges, there is a strong desire everywhere for personal contact. Many Soviet geographers would be glad to be in touch with people working on similar topics in this country. Links with geographers in the other communist countries are, of course, very close. Many Russians have undertaken expeditions and research in conjunction with them, notably in Bulgaria and China. A surprisingly large number of Russian geographers have worked in, or visited China, with the result that only in the U.S.S.R. is there a considerable body of knowledge of the present-day geography of China.

This question of contact was considered at length by Academician Gerasimov at Kiev, when on the opening day he delivered a report on the international links of Soviet geography. The Russians are especially proud of the increasing part which they are playing in the work of the International Geographical Union. Until a few years ago, there had been very little contact between Soviet geographers and the West, but in recent times a number of senior geographers have visited foreign countries. There is a widespread feeling that Western geographers know little of

Soviet work, a feeling not without justification. As a result, any Western geographer writing on the Soviet Union is given close and critical attention. A case in point is the paper by Professor D. Hooson on "Recent developments in Soviet Geography".[1] Gerasimov, in his Kiev report, dealt with this paper at some length and criticized it sharply. At Moscow University, a special seminar of the Faculty was held to discuss it. Here, the paper received more sympathetic treatment and was commended for the thorough acquaintance it displayed with Soviet sources, although it was criticized for some of its interpretations.

Summing up, the points which make, perhaps, the deepest impression on an overseas visitor are:

1. The vast scale on which geographical work is being done and the number of people involved.

2. The very strong practical bent and the pre-eminence of applied geography. Geography derives its great importance in the U.S.S.R. from its wide application to planning and the development of the country's economy.

3. Following from this, the close relations between geographers and government organizations. In return for the many tasks carried out for the government, geography receives considerable support in finance and facilities.

4. The enthusiasm of Soviet geographers for more, and closer, contacts with their colleagues in Great Britain and their great friendliness to visiting geographers. The writer was received warmly everywhere by Soviet geographers and shown unstinted kindness, hospitality and help. Their readiness to demonstrate and explain their work made possible the preparation of this account of their activities.

DISCUSSION

Afternoon Meeting, 17 October 1960

Before the paper the CHAIRMAN (Professor H. C. Darby) said: You will recall that Academician Gerasimov lectured in this hall in May 1958 on "The geographical study of agricultural land use", and that his lecture was published in the *Geographical Journal* for December 1958. In the following year, *Izvestia*, the bulletin of the Geographical Institute of the Academy of Sciences, printed an account of the work of this Society, written by our Director. The Society has exchange arrangements with the Geographical Society of Leningrad and with the Geographical Institute of the Academy of Sciences at Moscow. It is therefore appropriate that this afternoon we should hear a paper by Mr. R. A. French who is lecturer in the geography of Eastern Europe at University College London.

Mr. French has had experience of a number of university institutions either as a student or as a teacher—the University of Liverpool, the School of Slavonic and Eastern European Studies, University College London and Harvard University. Last year he was awarded an exchange studentship through the British Council at the University of Moscow for the session 1959–60, and during this time he was able to attend the All-Union Geographical Congress at Kiev. I will now ask Mr. French to deliver his lecture on "Geography and geographers in the Soviet Union".

Mr. R. A. French then read his paper

Dr. Terence ARMSTRONG (Scott Polar Research Institute): I would like to thank Mr. French for his talk and for having done what he has. He is a pioneer and he has made the most of his opportunity. I was interested to hear of the friendliness of the Soviet geographers, a point which my own experience confirms. I recently wanted to undertake some research in the U.S.S.R. At Soviet suggestion, I went as a tourist, and

[1] Hooson, D. J. M. 1959 Some recent developments in the content and theory of Soviet geography. *Ann. Ass. Amer. Geogr.* 1, 1, 73.

although I was only there a fortnight, it was possible to do a lot, owing to the ready help of Soviet geographers.

Mr. K. M. BARBOUR (University College London): What freedom has the appointed teacher in geography in the Soviet Union in choosing his line of investigation?

Mr. R. A. FRENCH: He has really a good deal of freedom in choosing the over-all line. He may decide to be a geomorphologist or a soil geographer. That is entirely up to him. But, when it comes to choosing a particular research topic, it will be indicated to him that certain topics are of particularly pressing importance and he will be guided by his supervisor in choosing one of these. It may well be that he could choose something quite different that was not considered a particularly important topic, but I never came across a case of anyone who had done so. I think that the individual topic has to be fitted into the over-all research programme.

The CHAIRMAN: May I ask two questions? How does the degree of candidate compare with our Ph.D.? Secondly—what are the constitutional relations between the institutes and the universities?

Mr. R. A. FRENCH: First of all—the Degree of Candidate is probably nearer to a London M.A., three years research, fairly closely controlled by the Supervisor. It is perhaps a little bit more than an M.A., but certainly not as much as a Ph.D. The Soviet Ph.D. is a considerably tougher hurdle to get over than ours. In fact, only at a fairly advanced stage of one's career could one expect to be awarded a Ph.D., with a long list of publications behind one. As regards the constitutional relations of the Institutes—there is no direct relationship. The universities come under the Ministry of Higher Education, and the Academy of Sciences is an independent body, divided into Research Institutes: the Institute of Forests, the Institute of Biology, the Institute of Botany, the Institute of Geography, and so on; these are branches of the Academy. But there is very close relationship of personnel, particularly at Moscow, where the majority of senior workers in the Institute of Geography also give lectures in the university; but for that they receive two separate salaries.

Mr. ORELL: I should like to ask Mr. French if he has any idea of the status of geography in the Russian secondary schools?

Mr. R. A. FRENCH: This to some extent I covered when I said that it seems to have been badly treated under the reform of education. As you know, there has been a movement to "strengthen the ties of school and life", and all pupils in schools spend two days a week working in a factory, or visiting a factory, or on a farm. This has meant a cutting down of academic teaching time and geography does appear to have suffered; whether it has suffered more than other subjects, I am not quite sure. But I do know that Soviet geographers feel very badly about it, and they are pressing to have alterations made in the new school programme. They also feel that the new textbooks which have been brought into use are not as good as the old ones.

Mr. J. C. STUTTARD: To what extent does the Soviet Government employ geographers?

Mr. R. A. FRENCH: To a very great extent indeed. They employ them by the hundred. The majority of ministries employ geographers. Some of them employ very large numbers, for example, the Ministry of Agriculture. I mentioned the Hydrometeorological Service, which is responsible for all weather recording and forecasting. There you have a large number of geographers, as also in GOSPLAN. They are used for research in compiling the seven-year-plan, the fifteen-year long-term plans, and so on.

A FELLOW: Can Mr. French say anything about the progress of the Virgin Lands scheme?

Mr. R. A. FRENCH: Very little was said officially about the progress of the Virgin Lands scheme as a whole. As you probably all know, the summer before this last one, the summer of 1959, was a very bad year in the Virgin Lands, and two eminent Party Members, Belyayev and Kirichenko, fell into deep disgrace over this. It was said that part of the trouble was that much machinery was in bad repair and there was not sufficient to get in the harvest. How far that is the case, and how far this is a long-term difficulty—the beginning of dust-bowl formation—is very hard to say.

A FELLOW: I wonder if Mr. French had difficulties with the language, whether it was necessary for him to have a profound knowledge of the Russian language? Whether on the other hand interpreters were used, or whether at conferences it was possible to understand all the discussions?

Mr. R. A. FRENCH: In my case, I have spoken Russian for a number of years. One can, in contacts with Russian geographers, get by with English because quite a large number of them have some English. Of course, there is little point in attending lectures and conferences without a fair working knowledge of the language.

A FELLOW: I would like to ask you, Sir, did you find at Moscow University students from under-developed countries, from India and South-east Asia and from China? And what is the position with women students in Russia; did you find many women students in Moscow University?

Mr. R. A. FRENCH: To take the last part first—yes, there are very many women. In fact, taking the country as a whole, more than half the graduates of the Soviet Union are women, who will of course go into exactly the same work. All jobs are equally open to women. As far as other foreign students are concerned, in Moscow there are a very large number, from very many countries of the world. China has the biggest contingent. From the other People's Democracies there are usually large contingents; there are several hundreds from the Mongolian Republic. Of the other Afro-Asian countries, the contingents varied in size; African students—not very many, perhaps 30 or 40, from Africa south of the Sahara. From western European countries, small contingents of 20 to 30 from France and Italy, and a small Anglo-American group on exchange programmes—perhaps 30 British and Americans altogether. India had a small number, usually of rather more senior research workers, perhaps 40 or so.

A FELLOW: May I ask two more questions? One—what use is made of visual aids in schools? And secondly, in the teaching in schools is there an integration between the physical and non-physical?

Mr. R. A. FRENCH: There is no integration at all in the schools. They do their physical geography first, and then their economic geography. As regards visual aids, I cannot answer this with any authority because I was not in schools to see how teaching was being done. All their textbooks on methods of teaching lay very heavy emphasis on visual aids, and if in the schools they live up to what they say, they must use them to a very large extent. On the other hand, in the universities they are very poor indeed in using visual aids. Lecturers rarely make use of slides, they will normally pin up maps on the wall, manuscript maps which of course are poorly visible, sometimes even to people in the front row. And this was the case even at the Kiev Congress. Only on one occasion do I remember a Russian lecturer using slides.

The CHAIRMAN: If there are no other questions, I am sure you would wish me in all our names to thank Mr. French for his extremely interesting account, and also to thank those speakers who have contributed to the discussion.

THE SECOND LAND USE SURVEY: PROGRESS AND PROSPECT

ALICE COLEMAN

Miss Coleman lectured at the Society on 28 March 1960 on the proposed new land use survey, and the discussion which followed is printed on pp. 181–6. The paper below describes the project and also reports on the progress up to 1 April 1961.

THE FIRST NATIONAL LAND USE SURVEY coincided with the nadir of the great inter-war depression. This has enhanced its interest as a historical document, but shortened its life as a current geographical reference source. As it has become progressively out of date, it has engendered an appetite for a similar, but modern source which would provide a record of the more prosperous face of this country, and it was to meet this growing need that the second land use survey was inaugurated in 1960. The purpose and procedure of the new survey have been fully explained in a special handbook[1] prepared for the guidance of field surveyors and will be briefly recapitulated here.

In harmony with the development of land use practice in many countries, the present survey incorporates a large number of categories to be mapped. For example, surveyors are asked to record individual crops, to class factories by fourteen types of product, and to note the distribution of a dozen kinds of natural vegetation. In all, sixty-four categories of information will be represented on the final printed maps. Far from deterring the surveyors (the greatest risk to the success of the project), the effort required to master the identification of so many categories has proved a stimulating challenge to those taking part, and the maps received to date have been, almost without exception, of a high standard.

In view of the wealth of detail portrayed, special measures are called for in order to maintain clarity and legibility. This is achieved partly by use of the relatively large scale of 1:25,000, and partly by grouping the categories so that the map can be read at two different levels of intensity. The first level consists of thirteen groups, each represented by a distinctive colour which can be easily discerned at first inspection. These adhere as closely as possible to the scheme recommended by the Old World Division of the World Land Use Survey, with one main deviation (settlement) and four additions:

> Settlement (residential and commercial), grey; Industry, red; Transport, orange; Derelict land, black stipple; Open spaces, lime green; Grass, light green; Arable, brown; Market gardening, etc., purple; Orchards, purple stripes; Woodland, dark green; Heath, moorland and rough land, yellow; Water and marsh, blue; Unvegetated land, white.

The second level at which the map can be read consists of subdivisions, represented by variations of tone within the main colour, or by superimposed symbols, or by other subdued cartographic devices, which do not obscure the unity of the main groups, yet are sufficiently distinct to permit the tracing of more accurate and sensitive correlations.

[1] *Land use survey handbook* by Alice Coleman and K. R. A. Maggs is obtainable from the Geography Department, University of London, King's College, Strand, London, W.C.2. Price 2*s* 6*d*.

In built-up districts a great many forms of land use are crowded into a small area as compared with the countryside, and there is relatively little space in which to represent them. It was decided, therefore, to associate together as a grey-coloured

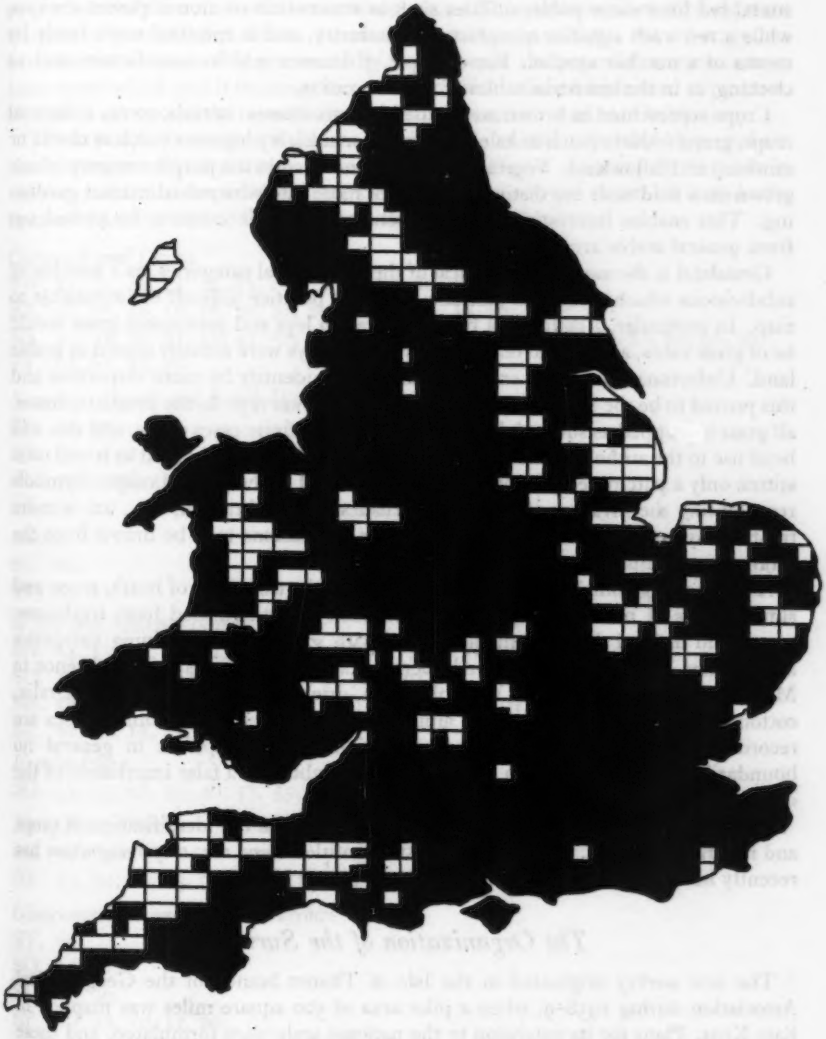


Fig. 1. Coverage map at 30 April 1961. White sheets remain to be undertaken

background all those forms of residential and commercial use which are common to all or most settlements, and vary more according to the settlements' size than to any other factor. This group includes housing, shops, hospitals, churches, business and administrative offices, places of entertainment and so on. Conspicuous against

this grey background are brighter colours representing forms of use more individual to particular settlements, e.g. industry, transport, open space or allotment gardens.

The types of subdivision employed may be exemplified by reference to industry. Red cross-hatching denotes extractive industry and red stipple active tips. Horizontal red lines show public utilities such as waterworks or atomic power stations, while a red wash signifies manufacturing industry, and is specified more finely by means of a number symbol. For example, 7 denotes vehicle manufacture and 12 clothing, as in the industrial tables of the last census.

Crops represented in brown are divided into six classes: cereals, roots, industrial crops, green fodders (such as kale, mustard or maize), ley legumes (such as clover or sainfoin) and fallowland. Vegetable crops are included in the purple category; those grown on a field scale are distinguished from more intensive mixed market gardening. This enables interesting concentrations of vegetable crops to be picked out from general arable areas at a glance.

Grassland is the most problematical of the agricultural categories, as a number of subdivisions which would be desirable prove in practice difficult or impossible to map. In particular, a distinction between rotation leys and permanent grass would be of great value, and indeed on the pre-war maps leys were actually shown as arable land. Unfortunately a ley is extremely difficult to identify by mere inspection and this proved to be the biggest cause of error in the old survey. In the present scheme, all grass is mapped as such. A letter L is added in definite cases of ley, and this will be of use to the authors of the proposed county land use memoirs, but as it will constitute only a patchy record it will not be transferred to the printed maps. Symbols representing the invasion of pasture by rushes, scrub, bracken, etc., are a more trustworthy guide to grass quality and further conclusions may be drawn from the ratio of ley legumes to grass.

An interesting contribution of the new survey is its treatment of heath, moor and similar areas of untended vegetation. Saltmarsh is distinguished from freshwater marsh and unfixed dunes from those fixed with grass. The remaining categories are bracken, gorse, heather and/or bilberry, grass moor (with special reference to Molinia, Fescue and Nardus), wet sphagnum, drier sphagnum with Erica tetralix, cotton grass and/or deer sedge and alpine heath. The vegetation communities are recorded at intervals in their precise location on the map, but in general no boundaries are drawn between them, as these might give a false impression of the degree of accuracy achieved.

The *Land use handbook* contains notes and diagrams on the identification of crops and natural vegetation. A coloured filmstrip entitled *Land use: crop recognition* has recently been published by Common Ground (1951) Ltd.

The Organization of the Survey

The new survey originated in the Isle of Thanet branch of the Geographical Association during 1958–9, when a pilot area of 500 square miles was mapped in East Kent. Plans for its extension to the national scale were formulated, and these were triggered into action by the promise of a generous printing grant by Professor L. Dudley Stamp in October 1959. The handbook was thereupon prepared, and the project was publicly announced in January 1960. The success of the survey owes much to the Geographical Association, the Institute of British Geographers and the Royal Geographical Society, each of which in turn lent its platform for an exposition of the project and provided space for a map exhibition. By the time 1960 was a week old, one third of the country had been undertaken for survey by volunteer workers.

The next stage of recruitment involved letters to potential surveyors in the remaining two-thirds of England and Wales, in grammar schools, public schools, local geographical societies, training colleges, university departments, rural studies organizers, county branches of the National Farmers' Union and so on. By July 75 per cent. of the country had been undertaken. Thereafter requests for help were made in respect of 1961, and at the time of writing, April 1961, the coverage has been increased to over 85 per cent. By now, most of the potential surveyors have been approached, and it becomes increasingly difficult to find additional volunteers, especially as many of the remaining areas are remote from centres of habitation.

The $2^1/_2$-inch sheet areas which are still available are listed in full below, and are also shown as white squares in the coverage map, Fig. 1. As many of these are in holiday areas, it is hoped that a number of geographers will decide to include the open air pursuit of Land Use Survey in their holiday plans.

Cornwall and Devon
SW. 32, 33, 42, 43, 52, 53, 54, 72, 75, 85, 86, 96.
SX. 06, 07, 08, 16, 19, 26, 27, 29, 38, 39, 48, 49, 97.
SS. 21, 22, 30, 31, 41, 43, 50, 51, 52, 54, 60, 62, 63, 64, 71, 73, 81, 82, 92, 93.
ST. 02, 03, 11, 20.

Somerset, Dorset and South Wiltshire
SS. 92, 93.
ST. 02, 03, 11, 21, 31, 32, 41, 42, 51, 52, 60 (part), 62 (part), 81.
SY. 39 (part), 49, 89.
SZ. 91.

Sussex
SU. 82.
TQ. 81, 82.

Wales and Monmouthshire
SN. 34, 53, 56, 66, 74, 76, 79 (part), 84 (part), 86 (part), 90.
SO. 18, 19 (part), 22 (part), 29, 31 (E. part), 32, 39.
SH. 53 (part), 72, 80, 81, 82, 83, 84, 86, 90 (part), 91, 92, 94, 95.
SJ. 01, 02, 11, 21, 25.

Herefordshire
SO. 32, 35, 42, 45, 46, 53, 55, 56, 61, 65, 66, 74 (W. part).

Shropshire, Cheshire and Staffordshire
SO. 39.
SJ. 53, 54, 62, 63, 72 (part), 73, 83.

Gloucestershire and North Wiltshire
ST. 69.
SO. 61, 93.
SU. 09, 29.
SP. 00, 03, 10, 12, 20.

Oxfordshire and Northamptonshire
SU. 29.
SP. 20, 24, 33, 34, 51 (part), 52, 55, 61 (part), 65 (part), 66, 77.
TL. 09.

Huntingdonshire and Cambridgeshire
TL. 09, 16, 18, 25, 26, 28, 36, 37, 47 (part), 48 (part), 56, 64, 65, 67.
TF. 30 (E. part), 40.

Norfolk, Suffolk and North Essex
TL. 25, 26, 36, 56, 64, 65, 67, 74, 75, 79, 83, 85.
TM. 01, 16, 26, 27, 36, 37, 47 (part), 59.
TF. 52, 71, 72, 73, 74, 81, 83, 84, 94.
TG. 01, 04, 10, 12, 13, 20 (part), 32, 41 (part) 42.

Nottinghamshire
SK. 55 (part), 66, 69, 74, 76, 79, 84, 87.

Lincolnshire
TF. 05, 08, 13, 16, 17, 18, 19, 23, 25, 26, 27, 29, 30 (part), 33, 35, 36, 37, 38, 40, 43, 45, 46, 47, 48, 52, 55, 56, 57, 58.
SK. 84, 87, 91, 94, 98.
TA. 10, 11, 20, 21 (S. of Humber).

West Riding
SK. 59, 69.
SE. 07, 16, 26, 35, 36, 46, 51, 52, 53, 61, 62, 63.
SD. 65, 69, 78, 79, 88.

East Riding
SE. 63, 73, 85, 95, 96.
TA. 05, 06, 15.

North Riding
SE. 07, 08, 18, 28, 46, 56, 66.
SD. 88, 89, 98, 99.
NY. 80, 81, 82 (part).

Lancashire
SD. 37, 47, 65.

Durham
NY. 73.
NZ. 44 (part).

Northumberland
NY. 66, 67, 68, 69, 77, 79, 89, 97, 98.
NZ. 08, 19.
NT. 60, 71, 81, 91, 92.
NU. 10.

Cumberland and Westmorland
NY. 03 (part), 05, 13, 15, 16, 24, 25, 26, 33, 36, 37, 38, 43, 44, 46, 47, 48, 52, 53, 54, 55, 56, 57, 58, 59, 60, 65, 67.
SD. 08, 37, 47, 69.

Completed field sheets have been received from over 150 surveyors. These amount to approximately 13,000 square miles. In addition many other surveyors have reported good progress with their field-work.

A representative selection of field maps depicting different types of terrain was exhibited at the 1961 conferences of the Geographical Association and the Institute of British Geographers, in London and Aberystwyth respectively. The regional organizer for Northumberland, Dr. J. W. House, organized an impressive exhibition of local maps in Newcastle in December 1960, and similar displays are scheduled in Birmingham, Bristol and Swansea within the next few months.

When the field maps are received at the survey headquarters they are checked with great care and then reduced to the scale of 1:25,000. Dubious points are

resolved by reference to the surveyor, who may have to check various items in the field. When completed, the pairs of maps are ready to go to the printer. Ten university departments and one independent draftsman have offered help with this stage of the work.

The printing is being undertaken by two firms, Vincent Brooks, Day and Sons and Cook, Hammond and Kell, who are collaborating to ensure identity of type face, colour and general appearance in their respective products. Ten printings are needed. The first four are derived from grey, black, blue and orange Estar base transparencies purchased from the Ordnance Survey. The remaining six plates are produced entirely by the printers themselves. They comprise a second grey, red, yellow (which also produces woodland green and lime green in combination respectively with solid and a lightly stippled blue), light green, purple and brown. The maps measure 35 by $22\frac{1}{2}$ inches, and the area inside the margins corresponds to two 10-kilometre squares, printed side by side. Each map has a name and a number in the land use series, and also indicates the numbers of the corresponding pair of Ordnance Survey 1:25,000 sheets.

Two maps are in the press and expected to appear during the Spring of 1961. The Crowland Fens map (No. 499) illustrates the range of types of arable land with emphasis on cereals, industrial crops and vegetable crops. It is traversed by a strip of washland along the River Welland, which is still largely in pasture. The western edge portrays land rising above the margin of the Fen, with a rather different ratio of crops to grass and a string of Fen-edge villages.

The Princes Risborough map (No. 264) is completely different. It contrasts a section of the Chilterns with part of their frontal vale. It includes nearly all of the sixty-four categories of land use, but is predominantly an area of "normal" agriculture and will prove an excellent comparator for more specialized maps due to appear later.

The third map, Deal (No. 174), shows a part of the East Kent orchard belt with its associated market gardening, which gradually becomes rarer as the North Downs rise southward. The resort of Deal and the inland town of Sandwich make an interesting contrast; so do the Quaternary and Cretaceous portions of the coast. The area as a whole lies within the Kent coalfield and includes three collieries.

The Isle of Thanet map (No. 192) embraces a considerable variety of terrain. The extensive built-up area of the east gives place to cereal, potato and brassica land on the chalk anticline, surrounded by marshland in a state of transition from a grass to an arable economy. Two areas of mining subsidence are shown in the west and the edge of the orchard belt in the south makes this map an excellent partner for the Deal sheet for building up a block of maps in which the whole is more than the sum of the parts.

The fifth map, Nuneaton (No. 454), shows a group of industrial settlements in a matrix of high quality grassland with a large proportion of ley legumes.

The sixth map, Downham Market (No. 481), is bisected by the new drainage works which parallel the River Ouse and divide the characteristic arable economy of East Anglia from the more specialized farming of the Fens. A further contrast is noted within the Fenland itself, where the silty western part is characterized by fruit trees and market gardening.

The order of publication of the maps is governed by the order in which they are received from the field surveyors. The contrasts noted in the first half dozen maps are thus fortuitous, although they may derive in part from the more detailed scope of the present survey. The order of printing may, however, be interrupted for any map for which an outside source of funds is made available.

The cost of the Land Use Survey has very largely been saved by the contributions of the surveyors themselves, who have given their labour and provided their own maps. Where necessary they have also met any transport costs involved in the mapping. Without all this generosity the survey would not have been possible. With it, there is accumulating an impressive coverage of manuscript maps which of themselves make the project worth while quite independently of the printed maps to come. Moreover, the survey has proved to be a useful and stimulating open air pursuit and training in field-work.

Each printed map will cost £530 for a minimum of 1000 copies, or 11*s* each. It is hoped that the bulk of the outlay will be met by map sales, so that the initial investment can be recouped and recycled on a revolving fund basis. 11*s* is a fairly high price for a map, and to charge more might depress sales; therefore this price has been decided. In fact, the purchaser will receive excellent value for his 11*s*, as the maps include the whole of two Ordnance Survey $2^{1}/_{2}$-inch sheets (now costing 8*s*) as well as all the land use data. At present, preparation and distribution are being covered by means of voluntary service, but it would be desirable to obtain grants to establish a publishing organization later. Meanwhile it is planned to cut the costs of distribution by selling the maps at geographical conferences as far as possible, while an honorary business manager has offered his services for postal distribution; postal charges will have to be recovered from the buyer as an extra.

The first-fruits of the New Survey

As an integral part of the project, it is proposed to produce County Land Use Memoirs which will adduce full geographical correlations with the help of geological and soil maps, meteorological data, agricultural and census figures, and all available cognate material. A number of authors have already been appointed, but their task cannot begin until the whole harvest of maps comes in from the field.

Meanwhile the Isle of Thanet Geographical Association plans to publish the individual sheet reports submitted by land use surveyors in its annual magazine *Panorama*. The first such report, 'Fakenham' by W. L. Barnard, was received in time to go to press with the 1960 issue.

The present paper provides an opportunity for recording two sets of the survey's first findings. First, the large block of contiguous maps in East Kent provide a specimen case for studying the stability of the interwar land use regions with regard to both their character and the position of their boundaries. Secondly, the wide scatter of maps received from different parts of the country permits a tentative indication of some general trends.

The land use pattern in East Kent

The territory covered by the pilot survey is that represented on the Ordnance Survey 1-inch map, No. 173. It comprises eleven physiographic divisions, three of chalk, three of clay, two of sand and three of alluvium.

(*a*) *The upper dipslope and scarp-face of the North Downs.*—Of the chalk areas, the upper dipslope has the most complex history. Because it stands high it came within vertical range of early erosion episodes, from which less elevated chalk lands were protected by a cover of Eocene rocks. As a result it has the greatest range of soils and slopes and its valleys are deep and steep sided. These qualities of terrain, together with a relative climatic severity due to elevation and exposure, tends to make the upper dipslope a rather poor region for Kent, and it is much divided by woodland strips which shelter the fields and, incidentally, harbour destructive animals.

In the nineteen-thirties this land had tumbled down to poor grass, but Professor Stamp noted signs of former prosperity, and discussed potentialities which have, in fact, emerged as post-war developments.

The range of soils is now much more appreciated. Each field is coming to be farmed on its own merits rather than according to the traditional system. The sandy Pliocene Beds afford an excellent illustration of this. When farmed in the same way as the limy soils of the chalk they proved acid and sterile, and were perhaps abandoned to gorse and heath, as on Creteway Down above Folkestone, and indeed also on the Noires Mottes, visible on fine days just across the Straits. But when treated as a sand the Pliocene Beds respond well to fertilizing for market gardening, soft fruit and even apple orchards, which are now beginning to flourish in surprisingly elevated areas.

Where the Pliocene has been removed the chalk interfluves have often weathered to form a layer of clay-with-flints, giving a cold, heavy but not infertile soil. It tends to be relatively shallow and may even be suitable for dessert apples, since restriction of roots is reflected in foliage restraint and a better chance for the fruit. Often it is covered by a top dressing of wind-drifted loam of excellent quality. A similar loam may have been trapped in some valley bottoms permitting sheltered and successful arable cultivation. In other valleys, steep, thin-soiled chalk walls are dominant with permanent pasture and strips of wood. Pasture with woodland is so common along the steepest valleys near Dover and along the scarp-face that these areas have been separated by a broken line on the map (Fig. 2). For the rest of the upper dipslope no two valleys or interfluves are quite alike and it is perhaps best to sum up this region as one that is still finding itself agriculturally—an area with pockets of potential that could make it a mosaic composed of contrasts.

(*b*) *The lower dipslope and* (*c*) *The Isle of Thanet.*—The remaining chalk areas are both essentially sub-Eocene surfaces, from which the mantle has only recently been stripped, leaving Eocene relics to enrich the soil. Further enrichment has accrued from wind-blown loess, and the shallowness of the dry valleys tends to exclude from the soil catena the thin soils that characterize steeper sites. There is, however, a youthful thinness resulting from marine planation in eastern Thanet, and it is geographically satisfying to find that this poorer fringe has been built over and the richer land left to agriculture.

Both areas have traditionally been rich, unenclosed corn land, and barley and wheat still rank high in importance. Thanet's loamy soil, improved for centuries with seaweed, and its mild dry climate, form a milieu for barley which wins world prizes and commands Britain's highest barley prices. The lower dipslope, with equally good soils and a slightly wetter but more sheltered climate, bids fair to rival it. Again, both areas are alike in having few roots or oats. But for the rest of the farming pattern there is a difference. Whereas the lower dipslope has a fairly normal crop complement of kale, ley legumes and rotation grasses to support its animal population, Thanet has little fodder of any kind and fills the gap with superb brassica crops (especially broccoli) for the London market, which has been made accessible in this century by transport improvement. The mild springs permit an early crop of potatoes before the broccoli is planted out. Though of lesser quality than the barley or the broccoli, the potatoes command a good price at Covent Garden, because they mature in time to rank as second earlies. Thanet's farming system by no means excludes animals, but most of them are concentrated on the marshes, leaving a "niche" in the arable upland for the potato-broccoli specialism. On the lower dipslope, by contrast, the marshes are not so close to hand, and so both stock and fodder must be incorporated into the regional pattern itself. Tendencies

towards the Thanet system are noticeable in the lowest part where soil enrichment by Tertiary material is greatest. This fringe is indicated on the map by a broken line (Fig. 2).

As arable areas, the lower dipslope and the Isle of Thanet are interesting for comparison with the inter-war survey, when the cultivated acreage was at its lowest ebb (Fig. 3). It is improbable that the subsequent arable increase will everywhere be apparent on the new maps; in some areas it will be masked by the decision to show ley grasses in green, and ley legumes partially green, instead of brown as formerly.

The higher part of what is now definitely the arable dipslope was then so grass-dominated that quite a broad band was separated off for inclusion with the upper dipslope. Today the boundary has moved back to a much closer correspondence with the physiographic junction of upper and lower dipslopes. The northern boundary of the arable dipslope is also close to its physiographic counterpart along the foot of the lower Tertiary escarpment. This boundary was not invoked at all in the pre-war survey, as the shrunken remnant of the arable dipslope was included in the fruit and market gardening zone, then called the arable-fruit belt.

Thanet, by contrast, could not be closer to the inter-war picture. It is, as it was, an emphatically arable island. Its potatoes and cabbage were staples that could not be shaken even from a depression diet, while its broad unenclosed landscape had not even a modicum of hedges to encourage a decline to grass.

(*d*) *The lower London Tertiary Beds* constitute the first of the sands. They are in fact predominantly sandy and loamy and give excellent deep, workable and fertile soils, which lend themselves admirably to hops, fruit growing and market gardening. The western part of this area, which is nearest to the London market, was the first to develop these specialisms. Faversham cherry trees are famous, and other orchard fruits are also grown, especially on slopes above the frost hollows which are found here. Hops, which spring up annually, are less affected by frost, but more in need of shelter from winds. They occupy a complementary position in the valley bottoms, where they also find deep, loamy soils. Hops are declining in the coastal areas such as Thanet where there is a risk of damage from salt spray blown inland during gales.

In contrast, fruit growing is being extended further east. In the old survey relatively little fruit was found east of Canterbury, and even that was of recent introduction. In the absence of a railway this area did not supply the London market until road transport had developed sufficient speed. This condition of the easternmost Tertiary Beds explains also why it was easy to subsume part of the lower dipslope in the arable-fruit belt. Today, however, fruit and market gardening have come to dominate the Tertiary Beds south and east of Canterbury, and also along the southern fringe of Thanet. The newer orchards are often owned by small farmers who must avoid having all their eggs in one basket. Under-cultures of soft fruit or vegetables spread the basis of income but detract from the abundance of the tree fruit. The larger growers of the old-established fruit belt prefer to separate the different crops so that each can receive proper treatment without affecting the other. The highest grade orchards are grassed. They are neither grazed by sheep nor mown for hay; the grass clippings are allowed to decay *in situ* to add humus to the soil.

Thus, while the orchard region has come to be roughly co-extensive with the Tertiary Belt it is still subdivided on the basis of age and degree of capitalization into a true fruit belt, and a fruit and market gardening zone.

(*e*) *The lower Greensand, and* (*f*) *the Gault and Weald Clays.*—The lower Greensand cuesta bears no resemblance at all to the Tertiary Sands with their fruit growing specialism, and instead carries mixed farming not significantly different from

Fig. 2. Land use regions in East Kent 1958–9

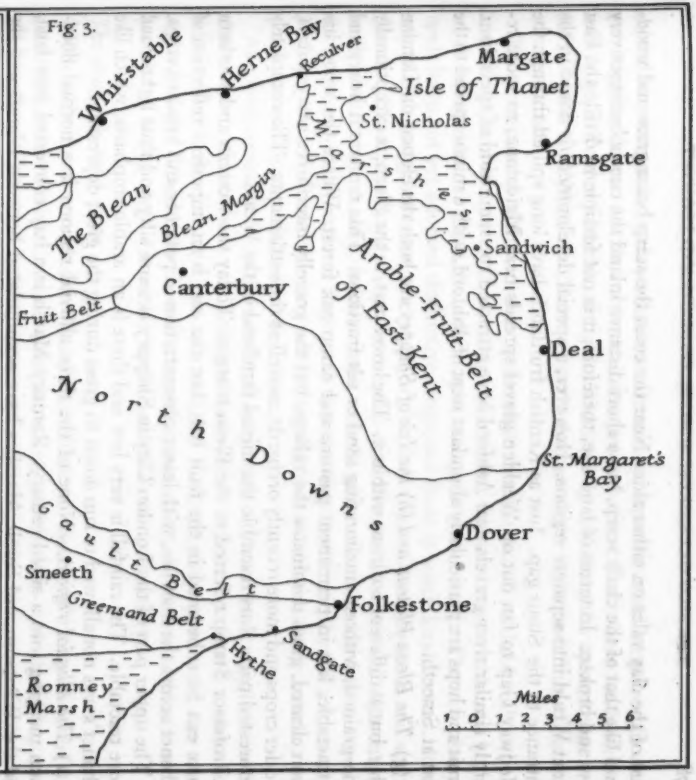


Fig. 3. Land use regions in East Kent 1931

that of the clay vales on either side. Near the coast the scarp bears grass and woodland like that of the chalk scarp, but a short distance inland the cuesta becomes very low and broken. In terms of land use, therefore, it is not feasible to divide the East Kent Weald into separate regions. However, a special development is noted in the entrance to the Stour gap. Just as Kentish fruitlands have long spilled through the Medway Gap to fan out on Wealden gravel spreads near Maidstone, so more recently similar river gravels near Ashford have attracted the same kind of specialism. Fruit and hops are particularly abundant west of Ashford, with a minor spread to the east at Smeeth.

(*g*) *The Blean Plateau and* (*h*) *the Isle of Sheppey* are both developed on London Clay, but at different horizons within it. The lower part, in the Blean, is exceptionally fine-grained, without ameliorating sand or silt fractions. This renders it heavy and intractable, left in permanent pasture and damp oak forest. Where the wood has been cleared, grass dominates the valleys, but the gravelly interfluves carry cereals, fodder crops and more recently orchards, as well as the settlements. The completely deforested parts thus resemble the mixed farmland of the Weald.

Professor Stamp referred to the Blean margin. Today the western and southern parts can be subsumed in the fruit belt, but the east is an imperfect reflection of Thanet across the marshes, with lesser concentration of potatoes and brassica crops.

The upper part of the London Clay in Sheppey is more silty and thus lighter and more tractable. The rainfall is very low and there is an arable emphasis, which like Thanet's was not allowed to run down to grass during the great depression.

(*i*) *The alluvial regions*.—None of the three alluvial regions is a normal flood-plain merging into a silted estuary. Romney Marsh is a bay converted into land, and the Wantsum and Swale Marshes have accumulated between islands and the adjacent mainland.

The marshland soils are generally rich loam or silt. An exception occurs in the Stour Valley above Chislet, where the flood-plain is above high tide level and probably predates modern silting. It is a commercial gravel, which is dredged in open water lagoons. The lagoon landscape is continued downstream as a result of mining subsidence near Chislet, and so for a stretch of several miles the pre-war agricultural use has been obliterated. The land use map shows the beginnings of mining subsidence along the Little Stour also.

The delicacy of marsh drainage arrangements and traditional flood risk, have for centuries excluded arable cultivation, and imposed a strikingly uninterrupted pastoral uniformity. The high water-table was a distinct advantage in keeping the summer pastures lush and nutritious. Those of Romney Marsh are fabulous and those of Thanet and south of the Swale also enjoy excellent reputations for fatting. North of the Swale, the pastures were much poorer. Since Sheppey has a small catchment area and no springs, and the area is extremely dry in summer, the farmers were particularly anxious to pond back dyke water early in the season to ensure full dykes into the summer. Such a prolonged high water-table waterlogged the grass roots and resulted in artificially shallow root systems. Then, when summer evaporation lowered the water-table, the plants' energies were diverted into repairing the damaged roots instead of producing abundant foliage.

It was emphasized in the Kent Land Use memoir that, if more water were released from the dykes, and the water-table kept as much as 3 feet below the surface, it would be possible to introduce a completely arable system, as in the Fens.

In the intervening period this suggestion has to a large extent been carried out. The war-time plough-up provided the initial impetus, but also revealed that, whereas soil and hydrological control favoured arable agriculture, there needed to be more

capital investment in roads so that tractors and implements could be moved in without bogging down. Arable cultivation has pressed ahead first where roads already exist, e.g., in Romney Marsh, along the Thanet Way and along the upland edge near Ash, Worth and Minster. More recently farmers have been installing their own concrete roads.

The present map of the marshes is therefore very patchy. Grassland still occupies large areas, and spray irrigation, using dyke water, ensures larger yields and higher stock maintenance to offset the reduction in acreage to some extent. The new ploughlands have not yet adopted distinctive crops and there is much local variety. Romney Marsh has great tracts of cereals, with a few acres of canning peas and spring flowers. Elsewhere marsh crops seem to be extensions of those on the adjacent uplands. Market gardening, fodder crops, cereals and even an orchard have invaded the marshes locally, and it is important to remember that they all mark a transition. Perhaps when the conversion to arable farming is more advanced the marshes may settle down into a specialism of their own.

As a final comment upon the new land use pattern of East Kent it may be recorded that the two islands have retained, and three other regions developed, a close correlation between the land use unit and the basic physiographic unit; the three regions of the Weald have become merged into one and the three marshlands are in process of losing their distinctive traditional land use personality.

The available 1960 *maps*

The only trend recorded in East Kent which is capable of being checked in a random scatter of maps from all over the country is the last—the ploughing-up of the marshes. This does, in fact, appear to be general. The increasing arable status of alluvial land is naturally most marked in the drier east, but scattered arable fields have been recorded in the Somerset levels, and there is currently an attempt by a Lincolnshire immigrant to plough up part of the lowland peats bordering Cardigan Bay. Piecemeal reclamation of peatland also continues in south-west Lancashire.

The Fens may perhaps be regarded as the arable prototype towards which the grassed marshes are now tending. It might be thought that the Fenland itself had no further scope for conversion to arable land, but in fact there are two types of site where additional arable acreage is still being created. Both result from improved flood security following the drainage works undertaken after the disastrous floods of 1947. The first type occurs in the washlands, which are embanked strips of land designed as safety tanks to contain floodwater. Now, however, some of their fields have come under the plough. The second type of site borders the major dykes or drains, which have been so effectively deepened and improved that their protective banks are no longer necessary and can be flattened, adding as much as an acre to many of the adjacent fields. The farmer must work on this dykeside strip for several years to upgrade it to the same quality as the rest of his land.

The maps so far received give no evidence of significant reclamation of the upland margins; reclamation of lowland heath seems more important, as in the New Forest and the Breckland. In addition to the well-known afforestation in the latter, considerable areas have also been broken in for a variety of arable crops.

Comparison with the inter-war picture is limited by the seven land use categories of the old map. Over and above this, the new map presents a vast range of detailed data which will be most stimulating to explore. Arable land, for example, varies from the type shown on the Princes Risborough map, where almost every ploughed field carries a cereal, to the specialized flower and bulb growing of the Spalding

area. One of the most interesting exercises will be to trace the regions of specialism, especially of industrial crops and vegetables which are either virtually absent, or strongly concentrated, in most of the maps examined so far.

The $2^1/_2$-inch O.S. map already carries fairly detailed information on urban form; to this the land use map adds data on both form and function. Compare, for example, the abundant open spaces of Folkestone and the closely-packed industrial settlements of Jarrow and Hebburn where open space is conspicuously lacking, even in new estates. Sheet 288 includes both the natural town of Harpenden with scattered industries and the planned garden city of Welwyn, with a neatly segregated industrial quarter beyond the railway track. Derelict land is much in evidence near Wath-on-Dearne, while numerous white patches near Sheffield indicate an

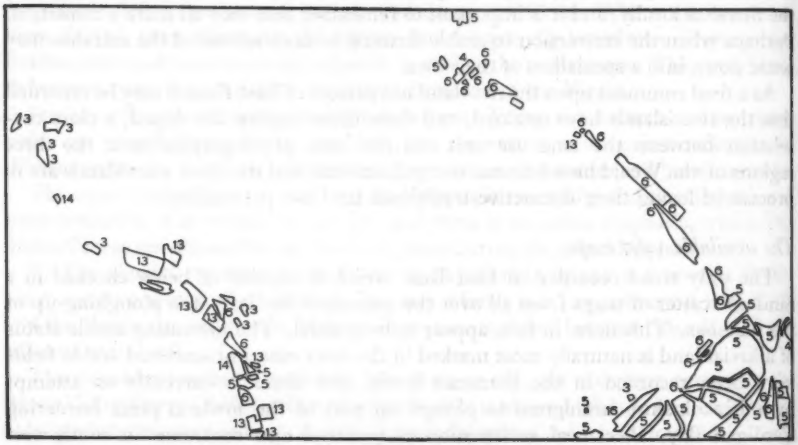


Fig. 4. Industry on part of the 1:25,000 sheet area SK39

extraordinary rate of stripping land for new development. The map of Sunderland emphasizes the riverside location of industry and a vast spread of post-war housing which, in fact, exceeds that of Newcastle-upon-Tyne. Great Yarmouth, too, on a lesser scale, shows an estuarine concentration of factories, while Birmingham's central industrial sector is so prolific with tiny jewellers that there is insufficient space on the map to show each one separately.

The area between Sheffield and Rotherham has been selected to illustrate the detail in which industrial location is brought out by the new maps. Figure 4 shows the valley siting of factories along the River Don and one of its tributaries. Along the Don in the south-east are twenty-five large works, 68 per cent. of which are concerned with metal manufacture (5). The valley of the Blackburn Brook by contrast has a preponderance of group (6) industries, engineering and electrical goods. The Upper Don valley displays greater variety, with eight works in the food, drink and tobacco group (13), seven devoted to the treatment of non-metalliferous mining products (3) and three each to metal manufacture and engineering.

The New Land Use Survey is still at an early stage, and this paper can offer no more than the merest hint of the great wealth of data that is being so generously amassed by the voluntary labour of so many willing hands.

DISCUSSION

Afternoon Meeting, 28 March 1960

The CHAIRMAN (Professor L. Dudley Stamp): It is approximately thirty years since I was on this platform, introducing the Land Utilization Survey of Britain which we started in October 1930, and I was then attempting to enlist the support of the Fellows of the Royal Geographical Society and of others who had been invited to the meeting. It is a wonderful thing, therefore, that after this lapse of time there should be people of vision and energy who see the necessity of doing more than a simple revision, extending land use studies from a geographical point of view. There is no need now to sell the idea that one must have a factual, cartographical record of the use and non-use of land in a country before you can hope to plan for the future. That is accepted now, broadly speaking, as axiomatic all over the world. We are to hear this afternoon from Miss Alice Coleman of the scheme which she has worked out, particularly with the help of the Thanet branch of the Geographical Association, for the new, the second, land use survey. The old land use survey had to feel its way by a process of trial and error largely supervised by myself and the Secretary of the Survey, Dr. Willatts, who I see is here this afternoon. With his presence there is a real continuity of work over the intervening period of time.

Miss Coleman then read her paper

The CHAIRMAN: There is no doubt Miss Coleman is right in saying this is an opportune time for this project. When we carried out the first survey in 1931 it was at a time we might call the nadir of British farming; in the presence of representatives of the Ministry of Agriculture I do not know whether I dare say that we are now at the zenith of British farming, but at any rate we are in a period when farming occupies a very different position in our national life and economy. This does suggest that the contrast between 1931 and 1961 will be of extreme interest. Some other changes have taken place in the intervening thirty years. It is an enormous advantage to have the Ordnance Survey 2½-inch map now; one of the things we would have given our right hands for when we were doing the survey previously and had nothing between a 6-inch and the 1-inch as base maps. It makes possible the portrayal on simple double sheets of far more than was possible on the 1-inch maps of the earlier work. Another great change has taken place: the increasing pressure of population on land resources. In Britain there is now a very severe competition for land, which grows day by day, new claimants make new claims. Since the 1930's there has come into existence, for example, the National Parks; and there is renewed interest with consequent demands on land for recreation, playing fields and urban parks. Another very important aspect which was scarcely thought about properly in the 30's was the concept of conserving, in certain selected parts, our native fauna and flora. We are very happy to welcome here the Director-General of the Nature Conservancy, Mr. Max Nicholson. May I ask him to say a few words, and I do hope he will mention the wider aspects of the work which the Nature Conservancy is undertaking, particularly their survey of the vegetation in the wilder areas.

Mr. MAX NICHOLSON: I do very much hope that this survey will be absolutely objective about what is on the land. We have, for instance, these categories like "rough grazing"; I think if wherever you see "rough grazing" you substituted "loose thinking", it would be just about as good a description of the land use. I entirely fail to see why the fact that an odd sheep or so strays at rare intervals over a bit of land is more important than the fact that (say) it is used by hundreds of people for recreation or that it has a tourist value as scenery. Some land which is nominally "unused" may have a very much higher economic value as scenery. For instance, in Devon and Cornwall alone, the foreign exchange earnings in one year recently were fifteen million pounds from overseas tourists; that is, not counting income from all the people from other parts of Britain. I do not know what the agricultural product of Devon and Cornwall is, net of subsidies, but it may well be lower. The two things are at least comparable. Some of these categories from the past are entirely subjective. They presuppose that

if land is not built over or mined it must necessarily be in actual or potential relationship to agriculture or forestry. That is not so. The Americans, who in many ways are more advanced than we are here in land capability survey, distinguish between land which has a capability for continuous arable farming or as grassland or only for wild life and recreation. The United States Soil Survey survey individual farms all over the country and set aside advisory plans for farmers on areas for wild life and recreation as well as the crops and the pasture and so on. The framework of land use categories in this country has been much too narrow. It may be a survival of the attitude that if people are enjoying themselves or on holiday there is something vaguely sinful about it and therefore it cannot be economic and productive for these people to be doing it; therefore we don't count it as a land use. The fact is that a good deal of land in this country has a capacity for productivity which is greater in terms of not ploughing it up, not growing softwoods on it and so on (very often with aid from public money). That way you spoil the scenery so that nobody is going to come across the Atlantic to see it. Why should they come from Sitka to see Sitka Spruce? So I would make this plea against bias. I am afraid it is almost inevitable that one tends to look at the thing very much through the farmer's eye, and that is fair enough where the farmer has a crop on it and there is no argument what the crop is. But there are cases where the use is simply something which is a counter in the game between the farmer and tax-collector or something. It is not an objective fact. It is just what somebody said about the way it suits them to have it classified. Where this subjective element comes in, we want to be very, very careful. If you look round the coast, for instance the coastlines of Cornwall or Pembrokeshire, you see all kinds of land which is supposed to be agricultural, but it is all poppycock. You can see that land is under bracken or brambles and gorse and so on—it is no more agricultural than this room is. Another more technical problem is that just as one has maps showing the liability to earthquakes—one has maps of the weak points of the earth's crust—in the same way there are many tension zones between ecological communities. Especially at the present time in this country you get areas of very dynamic change-over from, say, grassland to woodland. To get the real picture one really ought to have something corresponding to the earthquake lines. It might be useful, if possible, to mark on the map where those areas in very rapid change are, because your map may, on those areas, be out of date almost between the survey and the time it is printed.

Another similar technical complication is the mixed habitat. One of the great elements in land use in this country, which dates merely from within the last three hundred years, is the hedgerow. That is an awfully difficult thing to show on a map—you see it on an air photograph but it is a very difficult thing to show the different types of hedgerows, and here again there are very rapid changes taking place. Another similar example is ponds. Every time you have a scheme for piped water supplies on farmland, the regular accompaniment of that is that somebody goes down with a bulldozer and fills in a pond. That's the end of the habitat of a large number of small animals and plants but it is also changing the landscape. It is very remarkable when one compares the land management of this country and America. I think I read lately somewhere that since the war 39,000 new ponds of different sizes have been created in North Carolina alone. The Americans are making pools of water, partly for wild life, partly to help firemen and for many other reasons, just at the time when we are bulldozing our ponds in. The Americans, with Federal aid, are planting hedgerows at a time when we are grubbing ours up. We are grubbing up hedgerows in areas where they are then faced with a water shortage, partly related to the quickness of evaporation. Then you get a demand for irrigation and to meet it you take water from rivers dropping the water-level so that the aquatic life dies in order to make up moisture on lands which need irrigation partly because the hedgerows have been stripped away. If we are to handle these things sensibly we must have facts. That is why I hope, Mr. Chairman, that this map will show the truth as it is about what is now on the land, because as Mark Twain said: First get your facts and then you can distort them as you please.

I do hope that distortion will not be allowed, subconsciously, to enter in at the survey stage; there are a great many different ways of approaching land use in this country. One has, for example, to consider the potential of the land, what the land is capable of, whether it is reclaimable. There is also the aspect of intention. Planning may zone land for a purpose different from its current use. We must find first what the land is under objectively at the present time. There are many other layers of information and one very often gets some slight confusion, at the edges, between these different layers.

I would very much like to express my appreciation of what we have heard. I think this is going to be a most wonderful tool and I hope it will be as finely fashioned as possible so that it will give us the maximum aid for the very difficult problems that have got to be gone into in order to keep this country, which after all we are trying to live in, worth living in. If we are to make some very difficult decisions which have to be taken, as between agriculture and nature conservation, as between forestry and nuclear power-stations and so on, we need very much more sophisticated and very much more detailed material and I hope that this survey will help to give it us.

The CHAIRMAN: I am grateful to Mr. Nicholson for stressing this factual point of view. When we carried out the original survey we were most anxious to stress the fact that we wanted the picture of the present position without having any axe to grind in regard to future use. I am sure Miss Coleman has the same point of view in mind, very much the point of view of the geographer, the factual position. With regard to changes in land use there is the integration of farming and forestry. One has in these days to use that horrible word "agro-forestal"; or, as I have seen it recently, the "agro-sylvo-pastoral" use of land. As we have a representative of the Forestry Commission here this afternoon, I wonder if he would come and say something from the forestry point of view?

Mr. E. BARRINGTON: I would first of all like to say how very much I have enjoyed listening to Miss Coleman. Living as I do so near to London, and commuting daily through tens of thousands of acres of bricks and mortar, I am delighted to hear from her that some 90 per cent. of the area which she has already mapped in south-east England is open land, or agricultural land. In referring to woodlands Miss Coleman said that she showed them on her map by means of symbols of little trees. This is what the Ordnance Survey do and I hope she does not find it necessary to use as many symbols as they do. We all of us have to use maps in our offices for a variety of purposes: we have to draw lines on them, write on them, mark boundaries and so on, and it does not help us with our work if they are already plastered with little printed symbols. I would be interested to hear from Dr. Coleman how frequently she thinks it will be necessary to revise these very detailed maps which she is preparing, because change is going on all the time in our country and in some parts it is going on extremely rapidly.

The CHAIRMAN: I was going to call upon Mr. Wild who was the secretary of the Royal Commission on the future of Common Land, but he had to run away. There is one person who has been right in the thick of land use surveys and of surveys and mapping of all sorts right from the very beginning—Dr. Willatts, of the Ministry of Town Planning and Local Government.

Dr. E. C. WILLATTS: It gives me great pleasure to congratulate Miss Coleman on her paper. I have some acquaintance with the difficulties which inevitably beset an enterprise such as she and Mr. Maggs have undertaken. But difficulties are things to be overcome and I am sure that if, when launching the first L.U.S. thirty years ago, Professor Stamp had considered all the difficulties it might never have begun. It makes me feel quite old now to realize that it is almost exactly thirty years since I was one of his first volunteers, before I had any idea that a little later fate would find me playing a part in organizing the work. No one who was closely associated with the preparation of that earlier fragment of historical geography, for it is already being so described, could fail to be delighted that others are now organizing a new survey to be carried out by a generation of geographers who for the most part will be too young to have had first-hand experience of the fun and the problems which we encountered. I am sure that as the new survey goes forward it will give a great deal of pleasure and satisfaction

to those who carry out the work and it seems that the organizers have anticipated most of the problems likely to be encountered in the field. I am sure that the veterans of the old survey will join with me in congratulating Miss Coleman and Mr. Maggs on their plans.

Even with the experience of their predecessors available to them, and with many modern aids unknown when we were doing comparable work, the task will not be easy. I have not made any calculations of costs; to do so might well deter such an enterprise and that would be an unfortunate mistake. But to take only one item, I know that the cost of cartographic drawing alone is seven or eight times as much as it was thirty years ago. Of aids that can be invoked, I am rather surprised that no mention has been made of aerial photography. Since the war, aerial photography has been, with certain restrictions, available in this country and it can help in checking, evaluating and in indicating recent changes.

The new survey goes into very great detail on the rural side and the authors appear to be prepared to deal with almost everything rural. I would ask why the handbook says that in the pre-war slump period rotation grass was rare. In the thirties it was the chief crop of England and Wales and in some counties occupied more than half the arable land.

I am not alone in being surprised that there is rather less detail suggested on the urban side. Against a total of forty or fifty categories, we only have three or four for the towns. We are more than ever an urban people and there is a great deal to be said for looking closely at urban land uses, as local planning authorities are now being required to do. They now prepare land use maps every five years on the 6-inch scale for all the county boroughs and all the large towns. In those maps they show nine or ten categories of urban land use and some of these they subdivide fairly closely. As the smaller towns are not covered in such detail this work will never be a substitute for the complete survey envisaged by Miss Coleman. Without going into detail I think there might be advantages in subdividing the first main category so that we could distinguish at least residential, shopping and commercial uses. The present scheme would appear to put this house and everything else in and around Exhibition Road, whether it be flats, university buildings or the Albert Hall, in the same class. There would be problems of multiple land use in towns but they are inescapable with the present or a more complicated scheme because shops (which are now to be classed as settlements), and industry (a separate class), are often found on the same site at different levels. One of the major land users in and on the peripheries of towns is education and it has latterly shown the largest proportionate increase of all urban land uses. There might be advantages in distinguishing the land so used rather than in dividing it between settlement and open spaces.

The idea of subdividing industry is attractive and as some of the 1:25,000 sheets will cover areas that are almost entirely urban it will be of particular importance in such cases. The handbook mentions that it is proposed to use the classification employed in the Industry Tables of the 1951 Census. These followed the Board of Trade's Standard Industrial Classification and I am sure Miss Coleman will have noted that it was revised in 1958 when some re-grouping took place. For example, Precision Instruments now forms part of Order VI, Engineering and Electrical Goods. I fear that surveyors will often find difficulty in ascertaining the nature of manufacturing processes, for in this particular Ordnance Survey maps are not as informative as they used to be; they are now more likely to tell us simply that a building is a factory than that it is making carpets or carbide. If the facts are ascertained, recording may prove difficult, for reasons of space, for on the 1:25,000 maps a tenth of an inch square represents an acre and, especially on trading estates, there may be several different factories on one acre.

Derelict land is one of the really difficult things to map, but I am glad to see it included. I think the proposed distinction between industrial tips and derelict land may prove difficult; in the case of some large tips the answer may depend on which end the observer examines!

A survey by local planning authorities in 1954 revealed 126,000 acres of this class in England and Wales, an area larger than one or two of our smaller counties. The report on this noted the difficulty of maintaining the distinction between derelict land and industrial tips. A good deal of derelict land is due to subsidence and this may result in lagoons. These are also created at the rate of many hundreds of acres a year by mineral workings, which take something like three thousand acres a year in England and Wales. In the major river valleys, in particular, gravel winning produces lagoons. The Ordnance Survey shows such lagoons as water and their shapes change continuously as they are increased in area by extraction or diminished by tipping and restoration. I presume that on such areas the red or black symbol will be superimposed on the blue of the water shown by the Ordnance Survey. There will probably be various other areas where some kind of dual use may be revealed.

In making a few suggestions or criticisms, I hope I am not giving the impression that I am unenthusiastic about this new survey. I think that its potential is immense and the value of the record that should be created is something that cannot be calculated and it will increase as the years pass by. I wish this Survey every possible success.

Mr. BARRINGTON: May I ask how reliable children have been found for doing this work?

The CHAIRMAN: Before asking Miss Coleman to reply to the points raised, I would like to comment on that last question, because it is exactly the one which was raised when we did our first survey. It was felt by some that if we were using the elementary schools as we were (particularly the rural schools) there could not possibly be any value in the survey. What we found was that children of fathers who were brought up in close contact with the land and the crops, and with wild life as well, were extraordinarily knowledgeable. The standard went down from the elementary school in the country, to the secondary school in the town, and by the time certain town-bred students got to colleges and universities their rural knowledge was pretty poor.

Miss COLEMAN: In the section of the *Land use handbook* which deals with the technique of field mapping, the first sentence runs: "The first requirement for field survey is scrupulous honesty. The surveyor must resist all temptation to guess at the utilization of inaccessible places." I have been going round the country to "break in" a number of people who want to start mapping, and (so far) I have been highly impressed by the way they set about it. However, there is an independent check which can be applied—the correspondence of one surveyor's sheet boundaries with the next. I think Professor Stamp probably found this with the last survey. I am prepared for some inaccuracies and I am prepared to do a lot of checking myself, but so far I have been impressed by the standards of mapping that I have seen and I hope it is all as good.

I will take to heart Mr. Barrington's request for fewer tree symbols, but can only apply it to the new forest areas as we shall be using Ordnance Survey base maps and will have to accept all their existing symbols. How often would the land use survey need doing? I am afraid "need" is a word that must be left aside. How often *will* it be done? That will depend entirely on when the next person who wants to do it comes along. I believe Professor Stamp was asked in September 1959 when the next land use survey would be, and I am told he replied that he did not think there would be one. One month later we approached him. It will just depend on the circumstances that happen to inspire any particular individual to undertake it. The *need* may of course be more frequent than that, but the cost will keep the surveys down to a minimum.

I would like to thank Dr. Willatts very much for his contribution. Of course, he was one of the first people to give us a great deal of encouragement and help, and to make a number of valuable points which he will have recognized coming back at him in this lecture. For example, the suggestions concerning derelict land and unvegetated land came from him. I am grateful again for his further suggestions. With the industrial categories we are asking people to note what is produced in each factory so that it may be possible to readjust the categories. I like also his idea of separating educational

establishments. I am quite sure that the ratio of educational establishments to urban land in general would be of great geographical significance in showing the standard of living of the countries involved. It might not reveal great differences between the various parts of the British Isles.

You have all given me food for further thought and I do hope that people will look at the exhibition outside and, more particularly, volunteer their services to fill up some of the gaps.

The CHAIRMAN: In thanking Miss Coleman on your behalf, please forgive me if I add just one or two points. The original land use survey started in earnest in October 1930. We broke the back of the field-work in the one season of 1931; by the end of the summer season of 1932, that is in two years, the country was, broadly speaking, covered. I would appeal on behalf of Miss Coleman for *now* to be regarded as the time: the urgency of getting the snapshot picture. She has made a magnificent start, and it does need to be a picture relating to a specific and short time. The odd bits which remained to be done of the old survey after the first two years were mostly in the remoter areas where changes were not rapid; the fact that some of those areas were covered later did not really make much difference. When I said as late as September 1959 that another survey would not be carried out, I had in mind that it took Dr. Willatts and myself roughly seventeen years to work out the results, to get the maps and the reports published—that's what took the time. But the snapshot picture was made, and I think that if Miss Coleman can get the field-work done she will have created an historical document which in years to come will be enormously appreciated as a picture of this time in our history. If the field-work is finished by 1961, Miss Coleman, your collaborators and you will have earned the lasting gratitude of those who will come after for such a factual record. On such a factual basis there will be ample opportunities for interpretation and deduction. Thank you, Miss Coleman, very much indeed for inspiring us this afternoon.

PROBLEMS AND DEVELOPMENT OF THE DRY ZONE OF WEST AFRICA

R. J. HARRISON CHURCH

THROUGH THE GENEROSITY of the Research Committee of the London School of Economics, and of the Governments of the Gambia, Senegal, Mali, Mauritania, Niger and of the Northern Region of Nigeria, I was able to revisit the Dry Zone of West Africa in 1959. In the last half-century European and African development has been mainly concentrated in the Humid or Forest Zone, but it is to the Dry Zone as "the pioneer fringe" of West Africa that attention will increasingly be drawn.

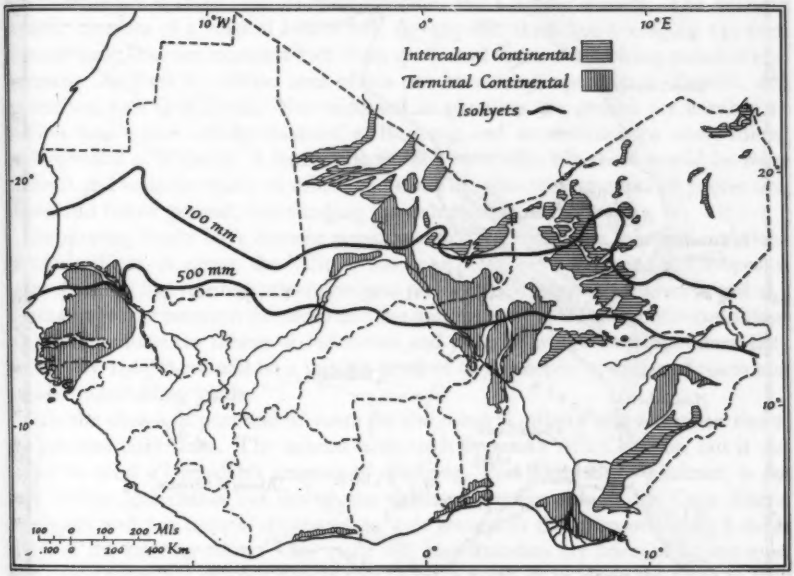


Fig. 1. The Dry Zone of West Africa north of the 500 mm. isohyet

There is no precise agreement as to the limits of the Dry Zone, either climatically, floristically, pedologically or otherwise, and what is on an average dry or arid, may not be in that situation at any given moment (Huzayyin, 1956). Drouhin (1953, p. 10; see also Shantz, 1956, pp. 3–7) has defined the Arid Zone as those areas with under 100 mm. (nearly 4 inches) average annual precipitation, and the Semi-Arid Zone as those areas with between 100 mm. and 500 mm. (nearly 20 inches) average annual precipitation. These two areas comprise my Dry Zone of West Africa.

The Arid Zone, with under 100 mm. of highly variable rainfall, may be devoid of vegetation in sandy areas or *ergs*, but it may support considerable thorn trees, bushes, grasses and ground plants in stony areas or *regs*, and along the surface of underground watercourses. These are often revealed with great clarity from the air by lines of thorn bush. Surface water does not exist where it rains only once or twice every four years but there is water at depth. In the heyday of trans-Saharan

trade it paid to tap this water in far more numerous wells and oases than exist today. Trade had then to pass across the dry zone and the desert, and slaves could be used to dig for water and to maintain the wells. Today North and West Africa have few trade connections, and what few they have are largely by sea, whilst the articles in demand have changed. It is not economic to use paid labour to maintain numerous

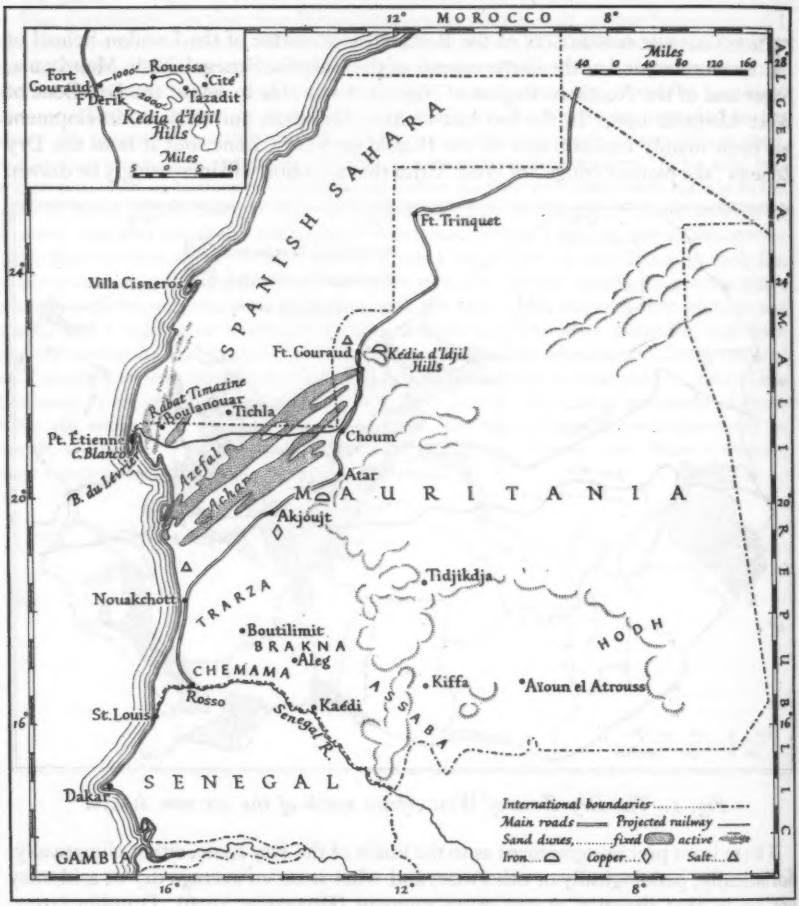


Fig. 2. Mauritania

wells for the small trade which survives in such things as salt, which still moves along trans-Saharan routes.

In arid West Africa, as in North Africa, economic advance would seem to depend upon mining and related water developments. The most promising project is that for mining iron ore in the Kédia d'Idjil range in north-western Mauritania. This range rises to nearly 3000 feet and extends for some 15 miles east and south-east of Fort Gouraud. Dark mauve in hue and, in parts, black, it bears striking evidence in gorges, valleys and torrential cones of one or several pluvial eras.

Segaud, a French geologist, first discussed the possibilities of exploitation in 1934. Further studies by Légoux in 1939, and by Blanchot and Pourquié in 1946, led to economic appraisals by the Bethlehem Steel Corporation in 1948, but this company later decided to concentrate its efforts in Venezuela. In 1951 a Franco-British-Canadian mission made further tests, as a result of which the present Miferma company (Société Anonyme des Mines de Fer de la Mauritanie) was founded in 1952. Detailed prospecting has gone on ever since.

In the centre and south the Kédia d'Idjil is composed of pre-Cambrian breccias unfavourable to mineralization, but on the northern edges are ferruginous quartzites with many local enrichments. In these occurs a kind of haematite which averages 63 per cent. iron, is naturally very dry, and is also remarkably pure chemically, particularly in its low phosphorus content.

A hard and heavy ore is dominant at F'Derik in the west; whilst at Rouessa and Tazadit the ore is softer, has an open structure and a lighter density. The F'Derik deposit consists of a vertical bed of ore, 65–325 feet thick but averaging 130 feet. Tazadit has three ore masses which form peaks and spurs overlooking an inner embayment. At least 87 million tons of ore can be worked opencast at Tazadit, and 23 million tons at F'Derik. Not reckoned in planning the project are another 15 million tons which can be quarried at Rouessa, and 20 million tons easily mined underground at F'Derik. A further 70 million tons exist but these would be more difficult and so more costly to mine; and there are also vast amounts of poorer ore, above and below ground, surrounding the richer deposits.

Preparatory works have become possible with a loan from the International Bank of $66 million. A camp, the "Cité", has been built near Tazadit for Europeans, each of whom has running water, because an abundant supply has been found at a depth of 130 feet between the camp and the mining site. As a result of air-conditioning, workers have the means of recreation and sleep in whatever temperature they desire. By 1965 there will be a mining town of 6250 people, 30 miles of roads and railway marshalling yards.

It is the choice of port and of route for the mineral railway that has given rise to the greatest difficulties. The nearest harbour is Spanish, Villa Cisneros, but it was found to need a formidable amount of dredging. Port Étienne, by contrast, is not only within Mauritania but lies on the sheltered eastern side of the Cape Blanco peninsula and has natural depths of 44 feet almost to the proposed quay 8 miles south of the existing town. This quay will accommodate ore boats of 65,000 tons, and a new township of 4500 people will be built north of it, along the track to Port Étienne. Until 1955 this settlement depended upon water brought from France; since then it has used water distilled from the sea. Underground water has now been found in vast quantities at Boulanouar, 75 miles north-east of Port Étienne, to which it can be conveyed by rail tankers. The shortest and easiest route for the railway from Fort Gouraud to Port Étienne would be across Spanish Sahara but the Spanish Government imposed conditions unacceptable to the Miferma company. A longer, all-Mauritanian line of some 400 miles is being built despite three problems. First, in order to keep within Mauritania, it will be necessary to drive a $1\frac{1}{4}$-mile tunnel through granite at Choum, adjacent to the south-eastern corner of Spanish Sahara, at a cost of £3 million. Less than 8 miles of transit across Spanish territory would avoid this.

The second problem arises from the necessity to cross the Azefal and Achar, two belts of stabilized dunes, midway along the southern boundary of Spanish Sahara and totalling 30 miles in width. Cuttings will be made to a depth of 7 feet and the sand held in place by spraying with heavy oil. Thirdly, there are active isolated

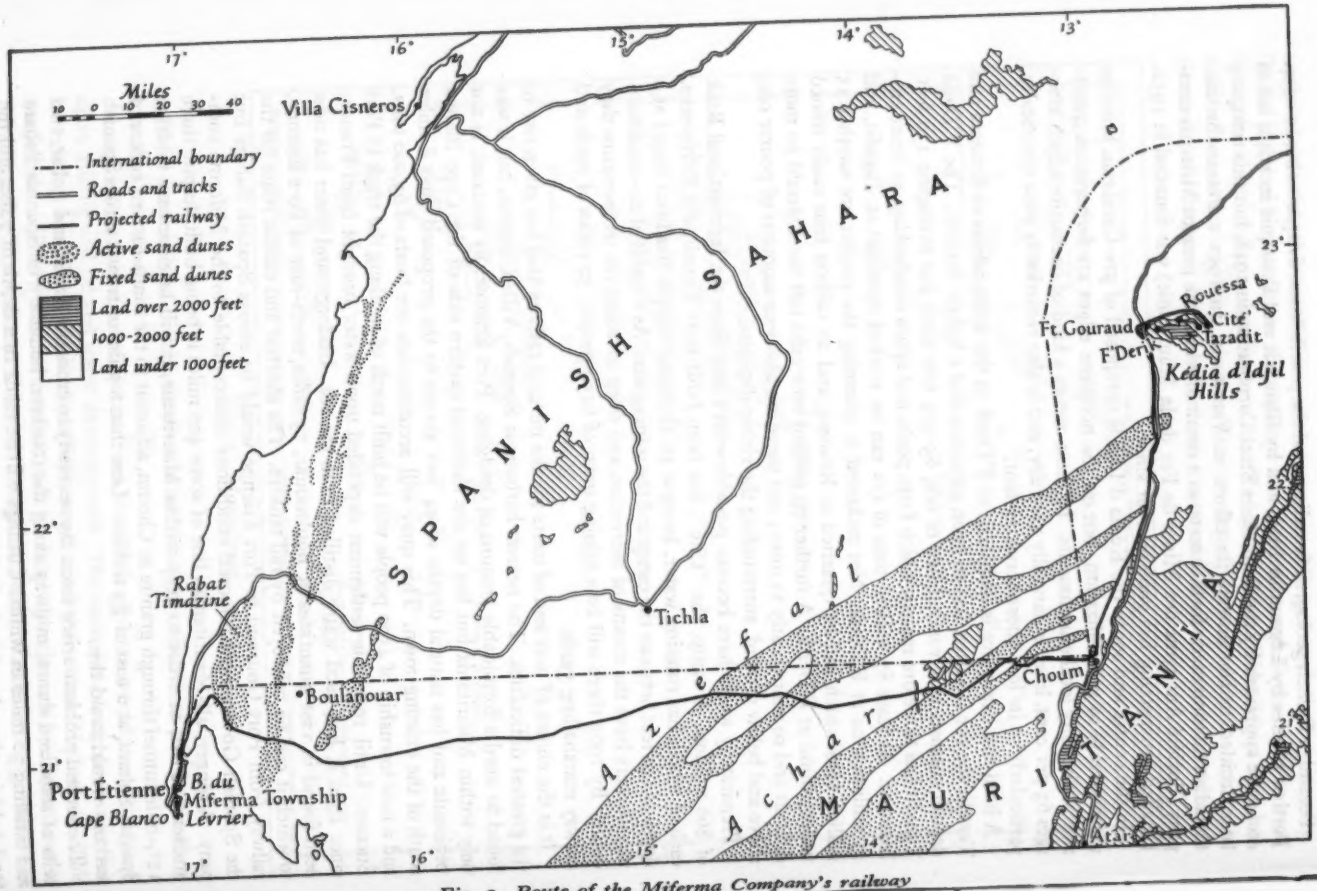


Fig. 3. Route of the Miferma Company's railway

dunes at the northern end of the Baie du Lévrier along about 20 miles of the route. The Russians have produced a chemical polymer for stabilizing active sands, but if these cannot be stabilized the line may need periodical realignment. Construction of port and railway has begun; commercial mining will start at Tazadit in 1961 so that when the railway and wharf are completed in 1963, with an initial annual capacity of 4 million tons of ore, there should be an adequate stock of ore awaiting clearance. Trains will consist of 135 wagons, each carrying 75 tons, a train thus transporting over 10,000 metric tons.

The Islamic Republic of Mauritania became independent on 28 November 1960, but it has never provided more than one-quarter of its expenditure from its own revenues. This will change by 1967 when it should receive £3 million annually from iron ore royalties, as well as indirect benefits. The new townships near Fort Gouraud and Port Étienne will employ several thousand labourers in a country where there has been almost no regularly employed labour.

Port Étienne will become Mauritania's first general port and will attract some traffic from Dakar, which has so far served Mauritania. It may also attract intercontinental air traffic and is already served twice weekly by large planes of Air France. So far, Port Étienne is merely a fishing harbour and processing centre. With better transport it could also become a minor resort, for it has long served as a leave centre for army personnel. Maximum daily temperatures from November to May and in July do not exceed 84°, minimum ones descend to 54°, and there are excellent beaches. Furthermore, a branch from the Fort Gouraud–Port Étienne mineral line may be built to open up copper deposits at Akjoujt, and poorer iron ore reserves between that settlement and Atar.

Until now the economy of Mauritania, such as it is, has been almost entirely based on its southern fringes along the Senegal river and in the Hodh cattle country of the south-east. Even the capital of Mauritania lay outside at St. Louis in Senegal until 1958. In the future, wealth will come once more from the Saharan regions at Fort Gouraud and Akjoujt. Port Étienne will be its window on the world, and Nouakchott the new capital.

Fig. 3. Route of the Miferma Company's railway

Although the Semi-Arid Zone has up to some 20 inches annual rainfall on an average, it nevertheless has a dry season of eight months or more, a formidable obstacle for life and economic development. Yet it was partly within this unpromising zone that the ancient Ghana, Mali, Songhai and other states were situated. There were certain compensating advantages in their rigorous physical environment, such as the open character of the vegetation and so of the countryside, as well as the virtual absence of the tsetse fly which permitted the use of the horse for distant travel and extensive administration. The Senegal and especially the Niger rivers may also have helped in these matters, and in the provision of water to alleviate the rigours of the dry season. These ancient States likewise had considerable economic advantages. In Bambouk, between the Falémé and Bafing headwaters of the Senegal and now on the border of the Senegal and Mali Republics, were gold deposits of the greatest importance. These states also lay in an intermediate position between the West African forest with further supplies of gold, slaves, ivory and spices; the Sahara with its vital salt; and North Africa with its cloth and access to European commodities. Trans-Saharan trade sustained cities of these states, lying at the meeting place of desert and "sown", e.g. Timbuktu and Gao, or at the fringe of forest and "sown", e.g. Kong (destroyed in 1895). To these States the forest was their frontier and pioneer fringe. To it went forth the Islamic missionaries and traders.

In modern times these space relationships have been utterly reversed. The Ottoman Turkish conquest of North Africa severely curtailed trans-Saharan trade, and the advent of the Portuguese, Dutch and other Europeans to the Guinea coast between the sixteenth and nineteenth centuries brought its final decay. The abolition of the slave trade eliminated the human power to dig and maintain wells along a decadent route. Modern economy spread inwards from the coast, either up the Senegal and down the Niger rivers, or through the forest. The pioneer fringe is now the desert. The Semi-Arid Zone that was once the most populated part of West Africa is now only sporadically well peopled; the area that was once the economic heart of West Africa is now, in general, one of the poorest parts. What are the prospects for revival?

The present economy comprises mainly the production of millet for food, which may be supplemented by rice wherever the seasonal flooding of river valleys occurs; of cucurbits for food and for domestic tools; of groundnuts, cotton, rice and tobacco for sale; of livestock-keeping by nomads whose interest in their cattle is only partly (though increasingly) economic; and of fishing for the sale of dried and smoked fish. Development and reform are restricted by the physical perils of rainfall that is small and highly variable in amount, in length of rainy season and in incidence within each season; of wind erosion of soil; of locusts and of massive attacks by the quelea bird. Economic problems are basically those of great distances from markets and from supply centres of imported equipment.

The Senegal and Niger rivers—vital to economic development—are the subject of comprehensive study and planning by the Mission d'Aménagement du Sénégal and the Mission d'Étude et d'Aménagement du Niger. Abundant water all the year round is the key to economic advance anywhere in the Semi-Arid Zone, and river water may be the cheapest source of this. It was the Great Depression that led in 1934 to the creation of the Mission d'Études du Fleuve Sénégal replaced in 1938 by the Mission d'Aménagement du Sénégal. The object of the latter is the comprehensive development of the valley. Agriculturally, this was thought of in terms of cotton until the Second World War made it impossible to import the necessary 60,000 tons of rice annually. Even the small amounts that were imported were costly in foreign exchange and difficult to obtain. In 1945 it was decided to undertake the mechanical cultivation of rice on the uncultivated level clay soils at the head of the Senegal delta.

The Senegal flood waters flow up the Taouey tributary (which thus becomes a distributary) into Lake Guiers. In the past, semi-nomads would build an earthen barrage each year across the Taouey to retain fresh water in the lake and prevent the tidal penetration of salt or brackish water in the ensuing dry season, but the barrage was always destroyed in the flood season. In 1948 a permanent barrage was completed near Richard Toll, whose sluices are open to receive the floods of fresh water from mid-July to mid-November, but are otherwise closed. Water is then pumped, at considerable cost, from behind the barrage into 62 miles of main canals and so to the 13,338 acres (1958–9) of mechanically cultivated and artificially fertilized rice fields. In that season these produced 14,647 tons of paddy rice—the only crop grown—and merely a quarter of what had been planned.

As with all large projects of mechanical cultivation, the Richard Toll Senegal Delta Irrigation Scheme has encountered great physical and economic difficulties. The outstanding physical one has been the ravages of the small quelea bird, popularly known in British Africa as the "bishop bird" and unjustly elevated in French terminology to "cardinal bird", both names being due to its lovely red markings. Almost unknown in the area until cultivation began, these birds now attack the rice

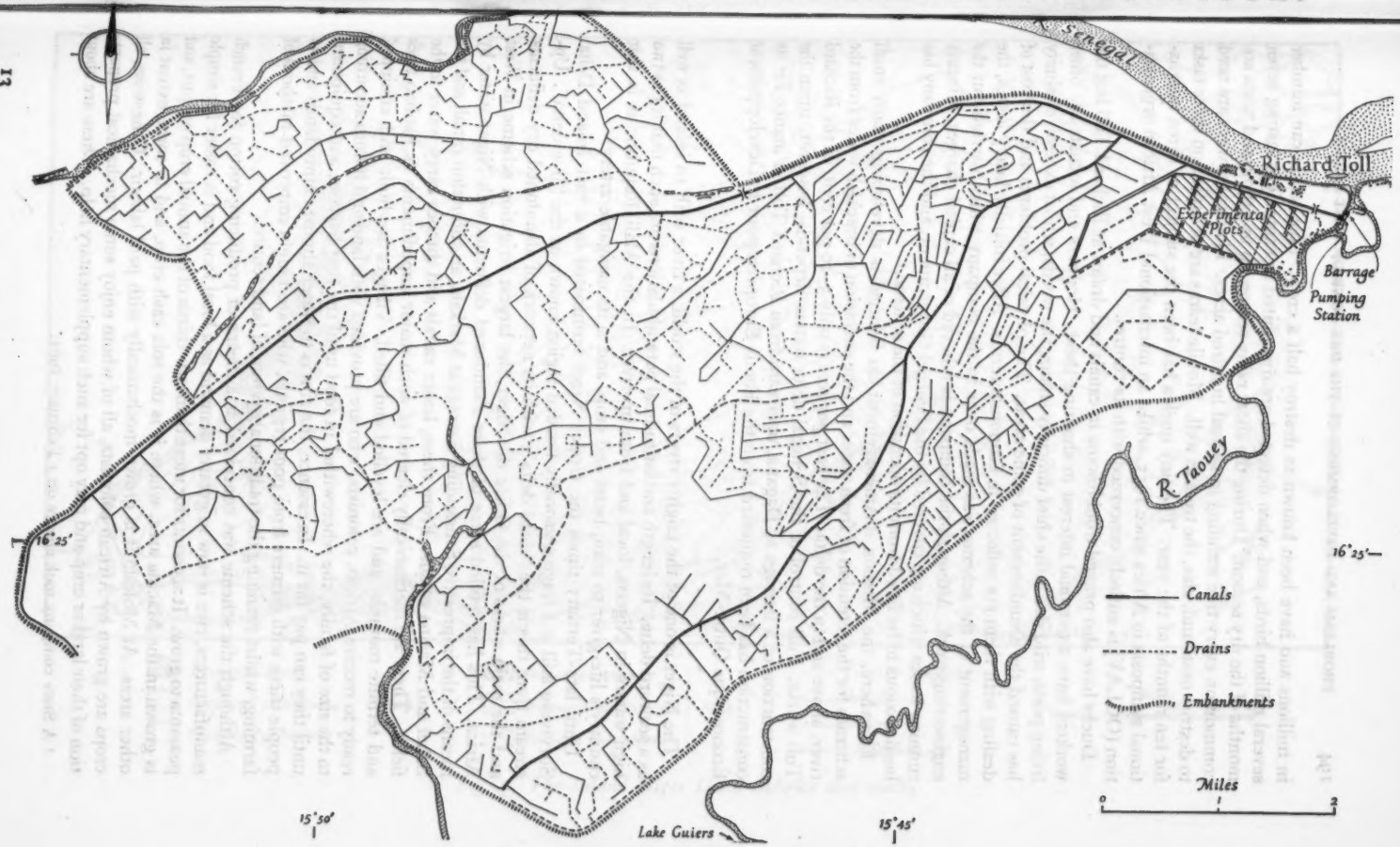


Fig. 4. The Richard Toll irrigation works

in millions and have been known to destroy half a crop. Tree roosts can number several million birds, and when detected are dynamited in campaigns lasting seven months of the dry season. During the short rainy season up to a thousand nests are common on every tree standing in several hundred acres. Flame throwers are used to destroy nests and, alas, the trees as well. Mobile teams are occupied on these tasks for ten months of the year. The tiny quelea has been the subject of three international symposia in Africa since 1955, whilst an international West African organization (OCLAV) is entirely concerned with its control.

Ducks have also proved troublesome in canals and drains at Richard Toll but the workers have a personal interest in shooting these. Hoppers and locusts are other living pests, wild rice is the chief difficulty among the weeds, whilst excessive salinity has caused the abandonment of some areas. The physical problems and the cost of dealing with them are reflected in economic terms. After initially heavy losses, the management of the scheme was made over to the company which carried out the engineering work. Although the company is relieved of all capital charges, it incurs running losses which are covered by the Senegal Government, and the company has been anxious to be freed from its operation of the scheme.[1]

Elsewhere, the Mission d'Aménagement du Sénégal is developing many small schemes for the retention of fresh water and the exclusion of brackish water from the river, above and in the delta. The cost per acre is only 5–10 per cent. of the Richard Toll works. Full control of the Senegal delta waters depends, however, upon the construction of a barrage at Dagana, upstream from Richard Toll. Finance for its construction has been requested from the Fonds Européen pour le Développement Économique Outre-Mer.

The Niger is one of the mighty rivers of the world, a river with an inland as well as a seaward delta. Its length and latitudinal perambulations are such that it has two high waters in Nigeria, local and from up-river. In the Mali Republic it is that country's life-giver to man, beast and crop, and is its navigable artery.

Until late-Tertiary times the Upper Niger terminated in a vast Inland Delta. Surviving still is a huge seasonally flooded region known as the "live delta". Upstream from this is the "dead delta", with its network of abandoned dry defluents and the main works of the Office du Niger, the largest irrigation scheme in West Africa. This has refilled some of these abandoned defluents with Niger water by means of the impressive Sansanding Barrage at Markala, an adduction canal, and the Sahel and Macina canals. From these, lesser canals and ditches carry water to the fields. These are mechanically cleared of such major impediments as baobab trees and termite mounds, and are levelled and tilled. Villages are built and equipped ready to receive African colonists, who are provided with land and homes according to the size of family, the wherewithal in food until the first harvest, and equipment until they can pay for it. In essence, the aim is to water almost empty lands and to people them with farmers from poor regions, who are taught improved methods of farming, whilst retaining the traditional system of land tenure.

Although the scheme was conceived as a means of producing cotton for French manufacturers, rice is now in greater demand as a local food and is easier for simple peasants to grow. It accounts for more than two-thirds of the annual crop output, and is grown in the Macina area, where it is the sole cash crop, and to some extent in other areas. At Molodo it is grown mechanically with paid labour. Otherwise, all crops are grown by African colonists, all of whom enjoy some mechanical preparation of their land or crop and may opt for such supplementary help. There are about

[1] A State company took charge on 1 February 1961.

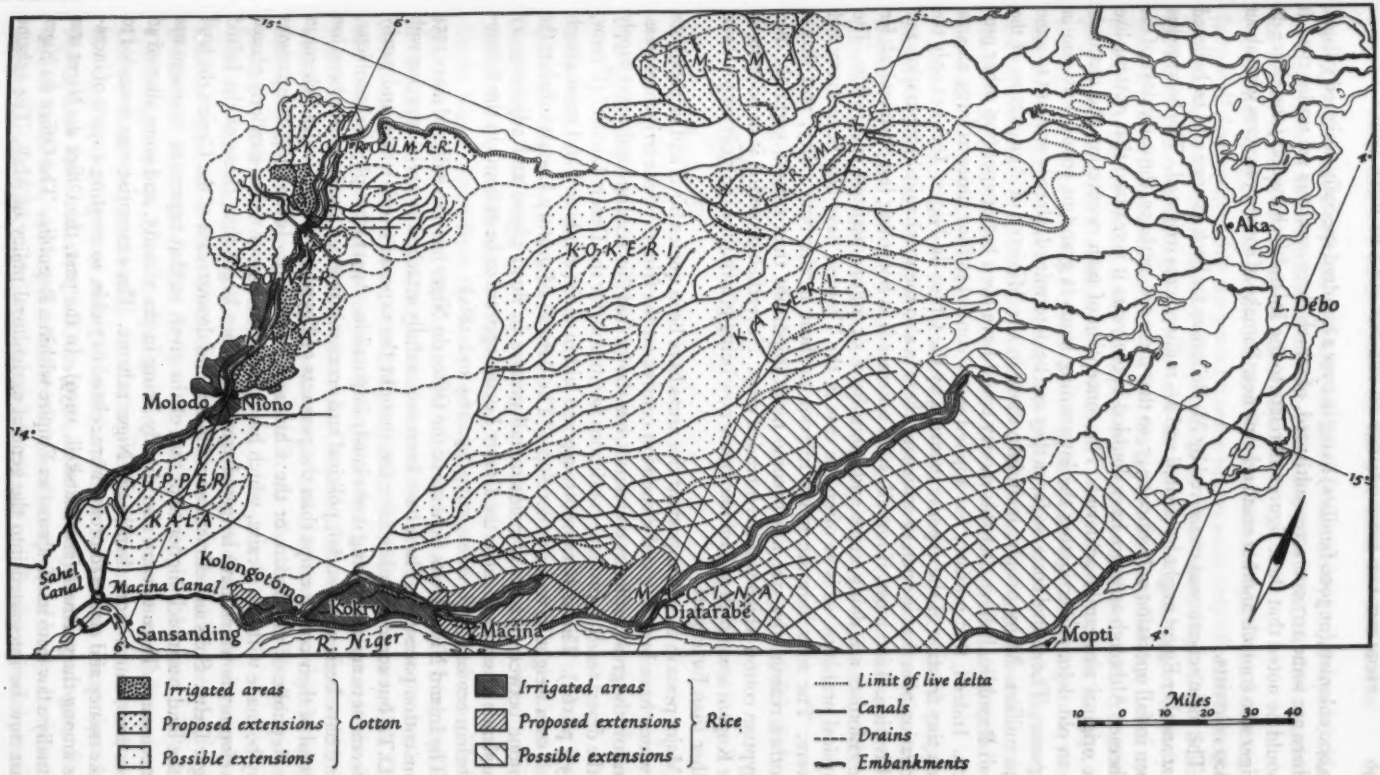


Fig. 5. The Inland Niger Delta Scheme and works

30,000 colonists (or 3000 families) living in over a hundred specially designed villages. There are some 107,000 acres cultivated, of which three-quarters are under rice. It should be noted that these figures all relate to the Inland Delta works; the Office du Niger also controls another small scheme near Bamako of some 7500 acres with about 3800 colonists.

The main scheme was conceived by M. Bélime as far back as 1922 and he believed that another Egypt might be created and $2\frac{1}{2}$ million acres irrigated. The barrage has been in full operation only since 1947, so that these are, perhaps, the early days of the scheme. Although acreages have doubled in ten years it is realized that nothing like the original aim can be achieved. The conception of man rewatering the channels of an old delta and irrigating the intervening lands is grand in scope, but also in expense. The capital costs, so far as they can be determined, already amount to some £30 million. Many people, including those in the Ministry of Agriculture of the Mali Republic, believe that this money could have been better spent on other projects. Indeed, that ministry has applied water control to four times as large an area for a tiny fraction of the expense incurred by the Office du Niger. It is not only the irrigation plan that is open to criticism; there is also the mechanical preparation and cultivation. Like most, if not all, such schemes it is becoming less mechanical, for the colonists are doing more and more hand or animal-assisted cultivation. The physical problems, as is so often the case in the Tropics, have also been many and severe. The soils here are much inferior to those in the Nile valley, and that is another reason why rice has become more important than cotton, certainly than Egyptian cotton which was the intended crop. Nevertheless, cotton is developing in the Kogoni area north of Molodo, but is now being grown (like the rice) for local sale rather than for export.

Major pests in the all-important rice areas have been quelea birds and locusts, both of which have breeding and dispersion centres on the fringes of the irrigation areas. Uvarov, the great authority on locusts, has shown that "increasing local water supply in the desert tends to produce conditions favourable for the Desert Locust" (Uvarov, 1957, p. 164). This is because its eggs are laid in moist sandy soil and must absorb their own weight in water to develop. "The African Migratory Locust inhabits the ecotone between stands of reeds or tall grasses in flood plains and adjoining dry grasslands or sandy islands; the Desert Locust appears to be at home in the Saharo-Sahelian ecotone." (Uvarov, 1957, pp. 164 and 186.)

The Inland Niger Delta Scheme of the Office du Niger has also suffered since 1954 from cotton parasites. These have been successfully attacked by aerial spraying with D.D.T., but some colonists have not thought the expense worth while, and patchy agreement to aerial spraying is obviously impossible. Apart from physical problems, there have been many social, political and economic ones. Colonists have been less careful of their cotton crops than the peasants of Egypt, or of the Gezira Scheme in the Republic of the Sudan, or the Chinese of their rice. Interesting comparisons may be made with the Gezira, which has a longer history of rather similarly phased developments which have irrigated areas ten times larger than those of the Inland Niger Delta. Soils and climate were kinder, and downstream of the Gezira the level of the land was much higher than that of the river, so that expensive drainage was unnecessary. Tenants were also already living in the vicinity, and were allotted 40 acres each, much more than in the Niger scheme. The enterprise was intended to make money and claims to profits were related to yields, so creating a spirit of incentive among the partners (see Gaitskell, 1959). In the past, the Office du Niger was virtually a law unto itself, almost an Empire within a Republic. The Office du Niger must now be integrated into the general agricultural policy of Mali. The scheme

cannot survive without massive grants, and these France may not always be able or willing to give to an independent country. If she does, the latter may feel it could use the money more productively in other ways.

It is interesting to compare the Richard Toll and Inland Niger Delta Schemes, the former all developed within ten years for some 14,000 acres only of entirely irrigated and mechanized rice production with paid labour. The Inland Niger Delta Scheme has developed over a longer period, with far greater acreages, almost entirely for peasant production, mostly of rice but also for cotton. Richard Toll has flatter areas, better soils, higher yields, lower transport costs and a nearby market. Yet neither project has succeeded economically. Richard Toll is retrenching its acreage, and although the Office du Niger is still extending its operations, it is doing so very carefully and is paying rather more attention to improving outputs and reducing mechanical cultivation. Yet one should not think of the Office du Niger scheme as just an economic failure. Rather it may be a case of heavy expenditure on social welfare put into a semi-economic project.

Below the dead sector of the Inland Niger Delta is the live part, a vast area approximately equal to that of England which is seasonally flooded from the Niger and its tributary the Bani. In the lowest part is the lacustrine region, whose numerous lakes are seasonally filled, and their fringes equally seasonally cultivated, and cattle

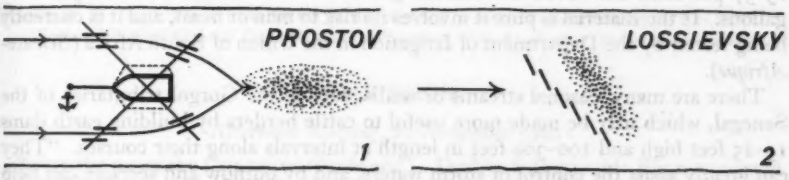


Fig. 6. Experimental methods of sandbank clearance used on the Niger River

watered and fed. It has been asserted that upstream withdrawals of water by the Office du Niger have adversely affected the lacustrine area. It is certain that full water control and longer growing seasons here, in the works of the Office du Niger, and in those of the Ministry of Agriculture, cannot be secured without a dam on the Upper Niger. Apart from the cost of such a dam, there is a political complication. The dam would lie within the Republic of Guinea which, far from deriving any benefit from it, would suffer submergence of some of its valuable riverine rice lands. All the advantages would accrue to the Mali Republic. The Ghana-Guinea–Mali Union may facilitate the Nianden project. This dam would, however, present the Mali Republic with some conflicts of interest. Control of the seasonally flooded areas would reduce seasonal pastures in some areas, while improving or expanding them elsewhere, thereby favouring some nomads to the disadvantage of others. Such a possibility is not one to contemplate lightly.

All-the-year-round, as well as easier, navigation would be possible by eliminating seasonal variation of water-level, and with it the sand banks which form under such conditions. Meanwhile, the Service Hydraulique of the Mission d'Étude et d'Aménagement du Niger is experimenting with two Russian methods used on the Don for dispersing sand banks. In the first method (Prostov), an anchored boat has two arms projecting from each side and just below the surface. From these hang flaps, rather like rudders, which can move or be moved according to water flow or desired water flow, and can thus be forced to wash away a sand bank. In the second method (Lossievsky), slightly overlapping but staggered wooden or metal panels are

either fixed on or hang near, the bed of the river, parallel with and just upstream from the sandbank. Flood waters are trained through the gaps and wash away the sand.[1]

The Mission d'Étude et d'Aménagement du Niger is undertaking many studies of possible works on the river, and of the effects of these upon its peoples. Grants are also given to French graduates in geography, men and women, to undertake investigations for periods of six months, the results serving the development of the Niger river, and as subjects for research degrees. Likewise, the Institute of Geography of the University of Strasbourg has undertaken many pieces of research for the Mission d'Aménagement du Sénégal.

North of the river Niger at its northernmost bend are semi-arid or arid regions. What are the possibilities of developing their water resources? Reference has already been made to seasonally flooded lakes, and to the possibility of lengthening the period of water-retention, and so the amount of water in them, by means of a dam on the Upper Niger. It may also be worth while to reduce loss of water by evaporation from these lakes. Australian experiments have shown that cetyl alcohol (Hexadeconol) can do this when sprayed on a water surface. In a 944-acre reservoir application of 6 lb. of this material each day for fourteen weeks reduced evaporation by 37 per cent. and saved 200 million gallons of water at a cost of 1*d* per 1000 gallons. If the material is pure it involves no risk to man or beast, and it is currently being tested by the Department of Irrigation in the Union of South Africa (*Science-Afrique*).

There are many seasonal streams or wadis, such as the Gorgol tributaries of the Senegal, which may be made more useful to cattle herders by building earth dams 15–25 feet high and 100–300 feet in length at intervals along their courses. "They can greatly assist the control of storm waters, and by outflow and seepage can help to maintain water in the stream course long after the rains have ceased. Consequently, habitations and water points can be distributed more evenly along river banks, and soil erosion and over-grazing may thus be avoided." (U.N.Econ. and Soc. Ccl., 1956, p. 90.) Single tanks, or groups of two or three, could also be built along watercourses, as in ancient Israel, in Roman North Africa, ancient and modern India, and the Somali Republic, but these are inclined to rapid siltation (U.N.Econ. and Soc. Ccl., 1956, p. 86). In fossil watercourses, such as the Tilemsi, bore-holes might be combined with tanks. In general, West Africa is more deficient in boreholes than in wells.

For underground water, the Inter-Calary Continental may be the main source of supply. Although less extensive than in North Africa, it probably holds great reserves of water, firstly in the north-central Niger Republic in the areas west and south of the Aïr massif, secondly in eastern Sokoto and western Katsina in Nigeria and in the adjacent Maradi area of the Niger Republic, and thirdly beneath thoroughly arid *ergs* some 250 miles north of the Niger Bend.

Another important water-bearing formation is the Terminal Continental of post-Eocene age which also lies west of the Adrar des Iforas in the Mali and Niger Republics, and extends into Sokoto province of Nigeria. It is also significant north of the Niger river and on the left bank of the Senegal river, where wells have made water available on livestock routes across Senegal in the Fouta and Ferlo regions which are devoid of surface water. The same aquifer probably occurs in south-eastern Mauritania at depths of 650–2000 feet, which are too deep for tapping under

[1] It was announced on 19 March 1961 that Mali is to receive a loan of about £16 million from the Soviet Union, part of which is to be used to improve navigation on the Niger.

present economic conditions. But conditions may change. They may change as a result of some major discovery like the oil of the northern Sahara, or the iron ore of the western Sahara. What is not worth while may become so. And in these days projects do not have to be even supposedly economic; there are many fairy godmothers willing to finance welfare schemes. While developments proceed and population increases in the Dry Zone, and international funds are multiplying, some profound changes are likely on the northern frontier of West Africa.

LITERATURE CITED IN TEXT AND DISCUSSION

Drouhin, G. 1953 The problem of water resources in north-west Africa. UNESCO Arid Zone Research Program, Vol. 1: *Hydrology*.

Fage, J. D. 1958 *An atlas of African history*.

Gaitskell, A. 1959 *Gezira, A story of development in the Sudan*. Faber and Faber.

Huzayyin, S. 1956 Changes in climate, vegetation and human adjustment in the Saharo-Arabian Belt with special reference to Africa. In *Man's role in changing the face of the earth*, ed. by William L. Thomas, Jr., University of Chicago Press.

Shantz, H. L. 1956 History and problems of Arid Lands development. In *The future of arid lands*, ed. by G. F. White, American Association for the Advancement of Science, Washington.

Science-Afrique (*Information Bulletin of the Joint Secretariat C.C.T.A./C.S.A.*) No. 10, p. 2.

United Nations, Economic and Social Council 1956 *Aspects of water development in Africa: World economic situation*.

Uvarov, B. P. 1957 The aridity factor in the ecology of locusts and grasshoppers of the Old World. UNESCO Arid Zone Research Program, Vol. 8: *Human and animal ecology*.

DISCUSSION

Afternoon Meeting, 21 November 1960

Before the paper the CHAIRMAN (Professor L. Dudley Stamp) said: For many years now Dr. Harrison Church has been engaged upon research into various aspects of the geography of West Africa. He has chosen that very extensive part of the world for his field of study, and I could not tell you how many times he has been back and forth and how many periods of his so-called "leave" he has taken from the University of London in order to carry out these investigations. So he has first-hand knowledge, stretching over a very considerable period of time, of this area. I am sure that most of you in this Hall will know of his large volume on West Africa in which he brings together so much material, essential to anyone who would make a serious study of the problems of West Africa, either of the whole, or only part. So that we look forward very much, Dr. Harrison Church, to hearing of the specific aspects with which you are going to deal this afternoon, the problems and development of the Dry Zone.

Dr. Harrison Church then read his paper

The CHAIRMAN: We are all grateful to you, Dr. Harrison Church, for pin-pointing in this enormous area of dry West Africa those tracts which are of such special importance; your very up-to-date information is certainly of enormous interest. We hear far too little in this country of the really practical works which are being undertaken in the former French West Africa. Some of you have tonight heard the name "Mali" almost for the first time. That is a measure of the rapidity of change in West Africa. Now we are fortunate in having here several who have travelled in or studied different problems of West Africa, and whom I know you would like to hear. I will call first on Mr. Prothero, who has made particular studies of population problems in West Africa.

Mr. MANSELL PROTHERO (University of Liverpool): Professor Stamp, Ladies and Gentlemen, I would like to echo your remarks about Dr. Harrison Church's lecture this evening, of the way in which he has brought to our notice parts of West Africa with which many of us are not well acquainted. He has done this also in his writing,

particularly his great book on West Africa. It brought to our notice the work of French, Portuguese and Spanish geographers, which is otherwise difficult for many of us to consult. For all this we are grateful.

I was extremely interested this evening to hear him speak of the problems of the irrigation scheme of the Inland Niger Delta, particularly of the enormous amounts of money that have gone into it. The results, one must admit, affect relatively small parts of the great Dry Zone of West Africa and, even allowing for the relatively sparse population, only a small percentage of the population. It is perfectly true that there are a great number of various fairy godmothers, national and international, at work at the present time, but I myself wonder whether money such as they have will always be available, and whether in fact it will be available on a large enough scale for a long enough time to promote developments such as we have been hearing about this evening over large parts of the Dry Zone. Recently in Northern Nigeria I had my attention drawn to a memorandum on the so-called "dying rivers" of Northern Nigeria in which problems resulting from desiccation were outlined. It drew attention to the effect of human activities on the landscape of parts of Northern Nigeria, which lie of course in more southerly latitudes than the area about which Dr. Harrison Church has been talking this evening. Rainfall is higher, but still unreliable and variable. In suggesting schemes to arrest these processes of desiccation I got the impression that here again the writer was hoping to attract the financial fairy godmothers who might promote something grandiose. I wonder whether perhaps more attention ought to be paid to developments on a rather smaller scale, which may be extended in due course to benefit a greater number of people and a greater area of land. I should like to hear Dr. Harrison Church's views on this.

From the point of view of my own personal interest in West Africa I should also like to ask him if from the Dry Zone, about which he has been speaking, there are any marked outward movements of population during the dry season; movements of migrant labour such as take place from north-western Nigeria and from areas in similar latitudes, to the areas of greater economic development?

The CHAIRMAN: Three other points of view we must investigate. I think Dr. John Clarke of the University of Durham is here.

Dr. J. I. CLARKE: Professor Stamp, Dr. Harrison Church, it is with some temerity that I speak tonight after this most enjoyable lecture, because my investigations have not been in West Africa, but in the steppes and desert of North Africa. I should like to point out that these zones receive rather different rainfall from those in West Africa. The French usually assume the steppe zone of North Africa as being between the 100 and 400 mm. isohyets, whereas the 100 and 500 mm. isohyets are the accepted limits in West Africa. Similar problems are encountered, especially the problem of water, but in North Africa, as Dr. Harrison Church has pointed out, the Intercalary Continental is more extensive than one finds in West Africa. However, the utilization by artesian wells of the Intercalary Continental in North Africa is practically confined to the desert zone. As we know, in North Africa the French have made great progress in transportation and have pushed tremendous arteries several hundred miles southwards into the desert. I should like to hear Dr. Church's views as to whether parallel developments are likely in the Dry Zone of West Africa.

Mr. Prothero has asked a question, which I should also like to pose myself. In North Africa, there is an important seasonal migration of people from the Semi-Arid Zone to the north, and I wonder if a similar sort of migration takes place towards the south.

The CHAIRMAN: It does not matter where in the world one has a semi-arid tropical belt, whether it is in South America, in Africa—South or North, or in Australia, you will find Dr. Monica Cole. So I am going to ask her to say something about her view of this problem.

Dr. M. COLE (University College of North Staffs.): There is one question that I would like to ask Dr. Church and it concerns the rice projects that he mentioned along the Niger. There are rice projects in other parts of the world, in countries with

somewhat similar problems. And I would like to know whether any measures for controlling the bird menace, other than purely destructive ones, have been worked out in West Africa? I have particularly in mind the rice project on the Kafue Flats in Northern Rhodesia and on the Marrakai Plains in Northern Australia. There they have been working on the height of the water-level in the fields and also on the gradients in the fields. In the scheme on the Kafue Flats I am not too sure that very much success has been achieved. Their problems are twofold: problems of weeds as well as the problem of birds, and if you control one you may encourage the other. But in Northern Australia I was certainly led to believe that, by controlling the height of the water and by regulating the gradients in the fields, at any rate the bird menace could be overcome.

Mr. B. H. FARMER (University of Cambridge): I would like to raise just two points, if I may. The first one is a question of historical geography. Dr. Harrison Church pointed out that in the semi-arid zone one has a sporadic distribution of population at the present time and the implication was, I suppose, that in the past the distribution was either not sporadic or less sporadic. I wonder whether there is any evidence that this was in fact so? My mind went off to the trading cities in the arid centre of Asia—Samarkand, Bokhara and so on. Around them were built states and empires. The cities were isolated centres of population in a sea of aridity in which there was nothing but nomadic population. Is it not conceivable that it was so in the medieval days of Ghana and Mali, which Dr. Harrison Church mentioned? Is there any evidence about it?

The second point, Mr. Chairman, is an economic one. It did not seem to me in the least surprising that the Richard Toll scheme had run into difficulties. Quite apart from the problems of salinity and birds and so on, they insisted on mechanized cultivation and pump irrigation. It seems to me that mechanized cultivation, apart from very special circumstances, is wrong for rice in underdeveloped countries, not only because of technical problems but also for economic reasons—that in a situation where capital is expensive and labour is cheap the obvious thing to do is to use intensive methods of labour. As for pump irrigation, I suppose one can almost generalize from Asian experience by saying that pump irrigation in an underdeveloped country rarely pays unless it is a means of growing a specialized and expensive crop in very special circumstances.

Mr. A. T. GROVE (University of Cambridge): I have the impression that the conclusions Dr. Church has reached, about the general trends of population movements and economic development in the dry parts of West Africa, apply to the areas through which the Niger and the Senegal flow, but not further east. The Hausa States, for example, lie in the Soudan zone, where the dominance of Kano has been reinforced rather than undermined in recent decades. The arid borders of the desert may be transformed locally, as in Mauritania, by mineral exploitation; eastwards, distances to the coast and Europe are greater, and prospects do not seem to be very promising for future development. One can reasonably look for continued relative if not absolute decline in population and economic activity in those dry parts of the continent.

Water is, of course, the clue to the situation; that has been shown quite clearly and conclusively this evening. One of the finest things that has happened in recent years in this Sahelian zone is the discovery of artesian water in a belt of about a hundred miles wide to the west of Lake Chad. This has been tapped in the last two or three years by something like a hundred boreholes. The question arises, what will the nomad Shuwa and Fulani do now that this water is available? How long will it be before grazing becomes a limiting factor rather than water; will the nomads settle down and take up agriculture; will cattle move in from other areas and so on? The side effects of these development projects, the chain reactions they set up, are often of greater interest and significance than the original schemes. The courses of such chain reactions are very difficult to predict. In the schemes mentioned by Dr. Harrison Church this evening, one wonders what kinds of land-holding arrangements have sprung up from the settlement of peoples of very different tribes in the irrigated lands in the Niger basin.

In the future, the waters of Lake Chad will probably be used more efficiently. They are not as fresh as they were once supposed to be but, especially in the north, are salty, thus disposing of a puzzle that has found many solutions. When eventually full use is made of the fresh waters of the Logoné and Chari rivers entering from the south, or rather when plans are made to use them fully, difficulties will arise like those in the catchment of the Niger, for near Lake Chad four newly independent African territories come together: Nigeria, Niger, Chad and the Cameroon Republic. Then there is the question of cost. £300 an acre is a great deal to invest in land, even in this country. Is there enough capital available in the world to allow wasteful expenditure on such a scale? Many large-scale agricultural development schemes in Africa are uneconomic and most of the greatest advances have taken place where opportunities have arisen for the African farmer to use his own initiative. More investigations are required into this type of growth, to complement the type of study we have had presented to us, so impressively, this evening.

Professor J. Wreford Watson (University of Edinburgh): No one, least of all a geographer, can fail to be interested in the many economic, social and political changes in Africa. We have a group in Edinburgh studying the problems of urbanization in connection with mining in Sierra Leone, and I would like to ask Dr. Harrison Church to expand his remarks about towns in Africa. In particular, what is happening in the towns in Mauritania, and how are they developing? Are they being developed along African lines mainly by Africans, and for Africans, or are they being planned by Europeans as Western communities? Do the plans for their growth envisage a new integration, or will towns continue to be congeries of White quarters, Arab and Lebanese quarters, African quarters, etc.? When the European leaves, will the town not be moulded more by the Lebanese and Arabs, who are so often the main shopkeepers, landlords and money-lenders? What is the cultural pattern that is about to emerge in the new towns of the mining centres of Mauritania, or of the irrigated tracts of the Niger?

Professor A. Austin Miller (University of Reading): You have mentioned the protection from evaporation in reservoirs by a monomolecular film of cetyl alcohol. That, of course, has been tried in Australia in quite a large way. There are two questions about which I should like information. One is whether this very thin monomolecular film can be maintained on the surface over a very large area of water in spite of surface wind? The second question is, what effect has this on the temperature of the water, since not only is there a check on evaporation loss, but also on the loss of heat by this evaporation? If water is heated, so to speak, by the sun's rays under cetyl alcohol, does it not so increase in temperature that it becomes perhaps a minor source of heat energy?

The Chairman (Prof. L. Dudley Stamp): The Chairman is not supposed to enter into the discussions, but many points of interest have been raised and I am going to ask Dr. Harrison Church one or two questions. In the Arid Zone Project of UNESCO we have a number of what, I think, are still outstanding problems. We have a cartographical section, and my colleagues ask me, as a geographer, "What ought we to try and map in the arid zone?" In other words, what research is necessary, which involves mapping? It is not as easy as it sounds. The geological map is an obvious need in connection with the search for mineral deposits, but my colleagues talk rather airily about the vital need for a hydrogeological map. When I ask them what they really want and how they are going to map it, they are not quite so clear. I wonder if you can give us some lead? You referred to the way in which the surface vegetation shows the course of underground streams. The word "artesian" has been used this evening; I wonder if that is correct, or not? I wonder if you could tell us what you think ought to be mapped under the title of hydrogeology? Others of my colleagues in UNESCO say that, having studied the work of Dr. Monica Cole and others who point out the significance of microrelief, what we need in the crucial areas is an investigation of microrelief, which makes such an enormous difference to possibilities of development. I wonder if we could have your reaction on that too? Others of my colleagues say, "Of

course, the only thing that matters is vegetation, which gives you a clue to everything. Just carry on surveying the existing vegetation (one of the objectives of the World Land Use Survey), find out the reasons for it, and you have the whole answer." Are there any other things which need mapping? Well, there are a lot of points; will you take up as many as you can?

Dr. HARRISON CHURCH: Professor Stamp, Ladies and Gentlemen. I am very touched by the kind remarks that have been made. To Mr. Prothero, may I say that I was also shown the memorandum about the dying rivers in Northern Nigeria. In my view the document was very controversial, and I found that quite a lot of the Government people also disagreed with it. As to whether there is much migrant labour from the Semi-Arid Zone, the answer is there is a very great deal of migration for two or three years, especially from farther downstream in the Gao area, and most of it is towards Ghana. Quite a lot of the servant population of southern Ghana comes from Gao and nearby towns.

Dr. Clarke asked about roads in the area. Contrary to the situation in most other parts of former French West Africa, the roads in this area are, in general, few and poor. The French based their economic development upon the river, upon transport up and down the river—although traffic is not very considerable—and upon roads going south.

Dr. Cole wished to know whether there were non-destructive methods being tried against the quelea bird. I think the answer is "No". So far as the Richard Toll scheme is concerned they have tried very many methods of destruction. I wonder, however, whether conditions are quite comparable between Richard Toll and the regions she cited? If these regions are in rather wetter areas that might be part of the answer, because the quelea bird is not, for example, a problem in the rice areas of the Gambia. It has been said to me on several occasions that, if only one could irrigate a huge area in all directions, then the problem of the quelea bird would be overcome. The difficulty arises because there is a great "island" of food and prosperity for the bird in an otherwise arid and barren area.

Mr. Farmer enquired whether there was any real evidence that the zone was more populated in the past, or less sporadically populated. The evidence is incomplete; what is certain is that in dry country north of the Niger River there were a number of settlements, some of which were successive capitals of ancient Ghana or of the old Mali (Fage, 1958, p. 18). Those areas might have been fairly well settled then, whilst those now settled may then have been unpopulated. More archaeological work is called for, but some is proceeding under the auspices of the Institut Français d'Afrique Noire.

Mr. Farmer considers that insistence upon mechanized cultivation and pump irrigation necessarily caused difficulties for the Richard Toll project. I agree that mechanized cultivation is costly and is being reduced in every large project I know, but I would not like to say that no mechanical cultivation can ever be economic. Mechanical cultivation can succeed in restricted areas with certain advantages but such areas are rare.

If simple gravity irrigation had been used throughout, some areas would have been excessively flooded. If this method had been confined to the mere 1500 acres of the lowest areas even these would have been over-submerged in most years, while irrigation of larger areas would have involved even more costly engineering merely to save very little pumping over a small area during one month only.

Here may I answer Mr. Grove and Mr. Prothero at the same time by saying that I certainly do, in general, favour small projects. They exist but, of course, they get no headlines, so that we do not hear much about them. Neither do they impress governments which, rightly or wrongly, often go for the large schemes because they are likely to be the ones that the people think they want. Mr. Grove mentioned the artesian developments near Maiduguri; I agree that the socio-economic aspects of water development are very important and need a great deal of thought and study. I was asked about the land tenure of the different peoples that come to settle in the Office du

Niger. The land tenure is that prescribed by the Office, to which all these different peoples must subscribe. It is certainly true that many, perhaps most, African crops have developed (such as Ghana's cocoa) as the result of African initiative, but I am not sure that is always the case. The successful Gezira scheme seems to me to show that cooperation, encouragement, guidance or direction can sometimes be helpful. I would suggest that in the difficult Semi-Arid (and certainly in the Arid) Zone nothing much can start without a certain amount of direction, initial survey, provision of water, and so on.

Professor Wreford Watson raised a most interesting point about the pattern of Mauritanian towns. It so happens that the Prime Minister of Mauritania is very concerned to build the new capital of Nouakchott in a kind of amalgam of traditional Mauritanian styles. The buildings that you saw on the screen are more or less temporary, but there is an impressive plan for the city, despite its most unpromising environment. It is intended to have buildings of two or three stories in traditional Mauritanian styles. Much trouble has been taken to find out what these traditional styles are, and how they can be synthesised. For example, the Institut Français d'Afrique Noire is providing photographs of typical Mauritanian houses for this purpose, and it is certainly intended that in Mauritania the buildings and the towns shall be truly indigenous. There are, of course, very few foreigners in Mauritania, so that the problem hardly arises to the extent it does in other West African countries, or more so in multi-racial societies.

As to Professor Austin Miller's queries, he knows more about the problem than I do. I know only of the experiments in the Union of South Africa and I would agree with him that the problem of rising temperature is an acute one. However, the other problem of use over a large area of water in spite of wind hardly arises in West Africa, where there are mainly small and seasonal lakes in the dry areas, and high wind speeds are rare.

Professor Stamp asked what we should map. I remember him once telling me he went to a population conference in Rome, where there was not a single map on display. I would certainly think that more population maps of all kinds are desperately needed of this or, indeed, many other areas. I am glad to say that one of the people participating in the discussion, Mr. Prothero, is doing his best to do something about this. We also need maps of population changes, of migration and of domestic trade. Professor Stamp mentioned the need for hydrogeological maps and there is a very fine example of one of these for Mali.[1] Vegetation is another important thing to map and there have been attempts at this.[2] Some of the graduate theses that I mentioned in my lecture dealt with certain of these subjects. Once again, my best thanks to the many people who participated in the discussion, which I think has been very rewarding.

The CHAIRMAN: You have already shown by your applause, that you feel that we have had an extremely interesting and most delightfully illustrated paper. I am sure, even the non-geographers here tonight have appreciated your skill, Dr. Harrison Church, as a photographer and that led us off to what has, I am sure, proved a very interesting and stimulating discussion.

[1] 1:1,000,000, *Hydrogéologie du Soudan Occidental et Oriental* (2 sheets), Service Hydraulique, Bamako, 1957.

[2] 1:200,000, *Cartes de la végétation*. Thiès, etc. Office de la Recherche Scientifique Outre-Mer, Paris.

THE DEPTH OF SOME LAKES IN SNOWDONIA

A. M. FERRAR

IN 1950 A REQUEST was received at the Royal Geographical Society for a bathymetrical map of Bala Lake similar to those published in the *Geographical Journal* of the lakes of the English Lake District (Mill, 1893–6) and the lochs of Scotland (Murray and Pullar, 1908). It was believed to come from a local resident interested in the possible effect on the lake fauna of proposed engineering and flood control works and led to the surprising discovery that no such map existed. The author accordingly undertook a survey, the result of which was published in the *Geographical Journal* in 1952 (Ferrar, 1952). It was also accepted by the Ordnance Survey and depth is now shown by contours on the 1-inch map, and will in due course appear also on the $2\frac{1}{2}$-inch map. In view of this encouraging reception attention was turned to other Welsh lakes for which also there is no indication of depth on the current topographical maps. None of these remaining lakes provided entirely fresh ground. Lake Vyrnwy is a reservoir and the general form of the valley which formerly occupied its site may be seen on the early Ordnance Survey maps. Many of the lakes of Snowdonia have been surveyed, by various methods and to varying standards of accuracy, but the only results which are generally available are those of G. M. Howe and R. A. Yates (1953) on Cader Idris and of T. J. Jehu (1902) in Snowdonia. The latter take the form of maps on a scale of 3 inches to 1 mile. They are not particularly well drawn and, though the positions of individual soundings are marked, none of them are labelled with their depth. Taking into account also that distances between them had not been directly measured but had been estimated by counting oar strokes, it seemed worth while to resurvey at least some of the larger lakes. So occasion was taken during the glorious summer of 1959 to apply the method used on Bala to as many as possible during the 2 weeks available for field-work. In outline the method is as follows: straight lines across the lake are selected at more or less regular intervals, with ends which can be accurately identified on the 6-inch Ordnance Survey map. In the case of Bala these were roughly half-a-mile apart, but on the smaller lakes of Snowdonia it was thought desirable to insert about six to eight per mile. Two ranging rods are then set up, one at the water's edge at the end of a proposed line and the other as far back from the shore as possible and aligned on the first rod and the point marking the other end of the line. One end of a half-mile length of fine twine, marked at thirty yard intervals with coloured tags, is then secured to the first rod and the line is allowed to run out under moderate tension from the stern of a boat which is rowed away from the shore by an oarsman who holds his course by keeping the two ranging rods in coincidence. Every time a tag runs out a sounding is taken with a lead line marked in fathoms and feet.

Work was completed on four lakes and the results are presented in the accompanying maps. They are not likely to surprise anyone who is familiar with glaciated land forms and it is interesting to compare them with Jehu's surveys. In general the agreement is good, but in the earlier survey depths are consistently overestimated, often by as much as ten per cent. In Llyn Cwellyn, for instance, Jehu shows an appreciable area enclosed by a 120-foot contour, but in 1959 no depth greater than 112 feet was found. In this lake he also failed to detect a well-marked ridge extending from the vicinity of the deepest point almost to the outlet. Both maps emphasize the contrast between the steepness of the sides and the flatness of the floor of the lake basin. In fact, the area over 90 feet deep is just over one third of the total lake area. The only other notable discrepancy is in Llyn Peris, which he shows as over 100 feet deep both at its centre and towards the outlet end. But large quantities of rubble from the Dinorwic slate quarries are continually being dumped into it and the north-eastern shore line

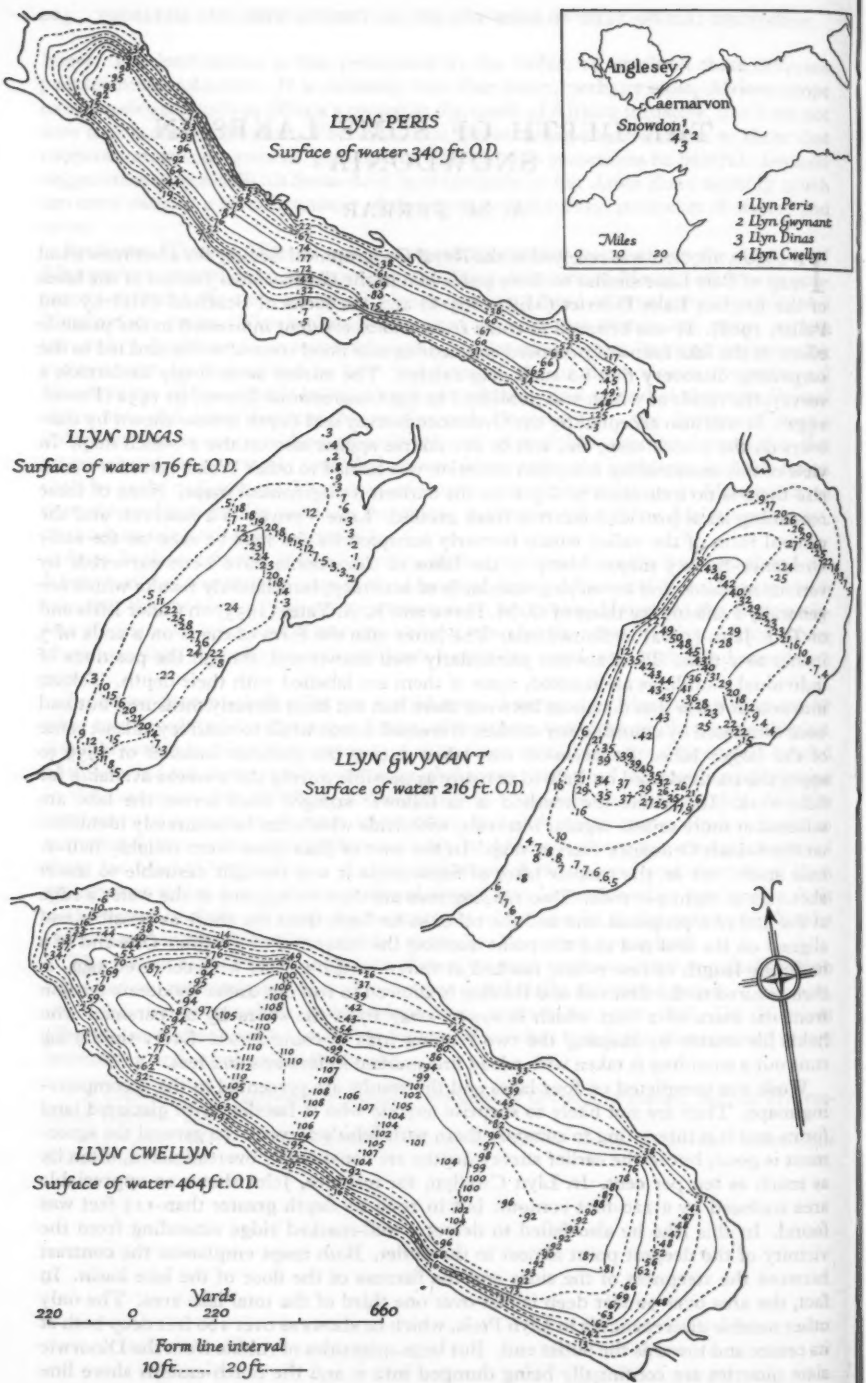


Fig. 1. Lake soundings in Snowdonia

has advanced considerably, accentuating the long narrow form of the lake, so that some at least of the disagreement is accounted for by change in the lake. In Llyn Dinas he shows a 30-foot contour, but the deepest point is now 28 feet and in Llyn Gwynant, too, he has slightly overestimated. It might at first sight seem possible that the difference could be accounted for by sedimentation during the fifty-seven- or fifty-eight-year period between the two surveys. There is no doubt that streams do bring detritus down with them, but a large proportion of it is obviously very coarse grained—pebbles and boulders are the commonest shore materials—and would be moved as traction load, not in suspension, coming to rest as soon as the water velocity dropped on entering the lake. What finer material there is could be carried further, but it is clear that deposits must be thickest near the stream mouths and become progressively thinner as the water deepens. The discrepancies between the two surveys do not follow this pattern but are roughly proportional to the depth of water, being greatest where the water is deepest. The rate of sedimentation is in any case not as rapid as this suggestion would require, or all the lakes in the district must have disappeared long ago, whereas it has taken the Afon Arddu the whole of post-glacial time to build the barrier between Llyn Peris and Llyn Padarn (see p. 208 below). The shorelines were originally surveyed by the Ordnance Survey in the 1880's and the only one of the lakes at present under discussion where significant revisions have been needed is Llyn Peris, where the waste from the slate quarry has accumulated. Even Llyn Dinas, which receives a larger proportion of fine-grained material from the Afon Glaslyn (due to the removal of its coarse traction load on its passage through Llyn Gwynant), and has a well-marked delta flanked by shallow water at its upper end, does not differ significantly in outline from the original survey; and this despite the fact that the bay on the south side of the delta is hardly anywhere more than 2 feet deep and is full of water-lilies, passing at its edges into a swampy zone. One must therefore look to deficiencies of technique to account for most of the difference. The author had the good fortune to do her first work of this kind in company with an assistant who had recent experience in small naval vessels, and was impressed with the care which is required to ensure that the lead line remains vertical while a sounding is taken and with the considerable difference in length between a wet and a dry line, particularly if it is new. Errors from these causes alone might easily be sufficient to account for the difference.

Although the results of the survey are not startling, and time did not permit of a proper investigation of the morphology of the district, some reflections upon it may not be out of place. The most careful account is still that of W. M. Davis published in 1909 (Davis, 1909). He used it as a case study illustrating the points at issue between the "erosionist" and "protectionist" schools of the study of the effects of glaciation on the landscape. At the time he wrote, Jehu's surveys had been available for several years and he refers particularly to Llyn Cwellyn. Noting that its lower end is half-a-mile above a rock step in the valley floor, and drawing attention to the contrast between the comparatively open character of the part of the valley in which the lake lies and its constriction immediately below, with the impressive truncated spur of Mynydd Mawr on the left bank, he concludes that it lies in a rock basin scoured out by glacial action. That there was a heavy accumulation of ice hereabout is witnessed also by the fine example of the consequences of diffluent ice flow displayed at the Drwys-y-Coed saddle just a little higher up the valley on its western side. If an attempt is made to reconstruct the pre-glacial form in harmony with the upper slopes of Mynydd Mawr on the north and the northern spur of Mynydd Drwys-y-Coed on the south, which represent surviving relics of the upland surface into which the valley has been cut, it is difficult to believe that the height of the saddle between them can have been less than 1200 feet. If this is so, glacial erosion has been responsible for lowering the watershed by 700 feet and displacing it about a mile upstream. It is the opinion of G. Dury (1955) that the section of the Gwyrfai valley at the outlet of Llyn Cwellyn is also due to glacial transection of the watershed and that in pre-glacial time this area drained southward to the Afon Colwyn. Other striking examples of the features produced by diffluence or transfluence (Linton, 1949) are at the Nant Ffrancon and Llyn Cowlyd

exits from the névé field which occupied the valley between Llyn Ogwen and Capel Curig, with which we are not here concerned, and at the western end of the Nant-ygwryd névé. Here the large quantity of ice from the east flank of Snowdon, and particularly from Cwm Dyli, must have raised the level until it overtopped the saddle between Snowdon and Glyder Fawr, then probably standing at about 1600 feet, and also that between the Lliwedd ridge and the high country between the present site of Llyn Gwynant and Blaenau Ffestiniog. In the former case the lowering at the site of the pre-glacial watershed is over 800 feet and the valley now heads nearly a mile further upstream at Pen-y-Pass. The ice responsible for this spectacular piece of sculpture flowed down the Llanberis valley receiving accretions, particularly from Cwm Glas, and must have been responsible for excavating the combined basin of Llyn Padarn and Llyn Peris. Only the latter was made the object of a survey on the present occasion, but the deepest point was found to be near the outlet, and reference to Jehu's map shows that the deepest part of Llyn Padarn is near its upper end. It thus appears very likely that they were formerly continuous and that the barrier between them consists at least in part of detritus brought down by the Afon Arddu. The former height of the saddle south-east of Lliwedd is less easy to estimate. There is no mistaking the height to which the Lliwedd ridge has been truncated, beside the upper end of Llyn Gwynant, but the valley is asymmetrical and consideration of its upper slopes would suggest that it is not vertically below the original ice outlet. This valley is, however, particularly deeply cut, descending to 250 feet little more than a mile away from Pen-y-Pass (1169 feet). It would appear that, between this point and Beddgelert, Nantgwynant contained a string of lakes in glacially eroded basins, of which all except Llyn Gwynant and Llyn Dinas are now silted up or drained. Dinas, indeed, displays particularly clearly that the silting up process is still continuing. The delta at its upper end occupies a considerable area and is very flat, the shoreline of its southern bay being ill-defined between marsh and shallow, weed-infested water. But, as already noted, the rate of sedimentation is slow. It is clear that these modifications of the Gwynant valley can only have been accomplished by a powerful glacier and one might have expected to find an unobstructed outlet similar to the Llanberis or Gwyrfai valleys, but instead the valley is closed by a rock bar which does not descend below 500 feet, except in the Pass of Aberglaslyn which is a narrow defile 1200 feet wide (at the 500-foot level) at its narrowest point and 450 feet deep. This is manifestly inadequate, and the well smoothed surface of the rest of the bar also indicates that it was overridden between Nantmor and the lower slopes of Moel Hebog. Aberglaslyn may have been initiated as the bed of a sub-glacial stream, enlarged to some extent by ice but largely cut by meltwater and deepened by river action in post-glacial time.

Acknowledgements.—The author wishes to express her thanks to Mr. Matthew Linton for his capable assistance in the field, and to Major Clarke-Jervoise and Doctor Brailsford for the loan of boats on Llyn Cwellyn and Llyn Gwynant respectively, and to the University of Sheffield for a generous contribution to the cost of field-work.

LITERATURE CITED

Davis, W. M. 1909 Glacial erosion in North Wales. *Quart. J. geol. Soc., Lond.* **65**, 281–344.

Dury, G. H. 1955 Diversion of drainage by ice. *Sci. News, Harmondsworth*, No. 38, 48–71.

Ferrar, A. M. 1952 Soundings in Bala Lake. *Geogr. J.* **118**, 60–3.

Howe, G. M., and R. A. Yates 1953 A bathymetrical study of Llyn Cau, Cader Idris. *Geography* **38**, 124–31.

Jehu, T. J. 1902 A bathymetrical and geological study of the lakes of Snowdonia and eastern Caernarvonshire. *Trans. roy. Soc. Edinb.* **40**, 2, 419–67.

Linton, D. L. 1949 Watershed breaching by ice in Scotland. *Trans Inst. Brit. Geogr.* **15**, 1–15.

Mill, H. R. Notes in *Geogr. J.* **2** (1893) 165, 362, 376; **3** (1894) 421; **4** (1894) 237; **6** (1895) 46, 135.

Murray, Sir John, and Laurence Pullar 1908 *Bathymetrical survey of the fresh-water lochs of Scotland.* Reprinted from *Geogr. J.*, 1900–08, and published by the Royal Geographical Society.

GROWING MOUNTAINS AND INFANTILE ISLANDS ON THE WESTERN PACIFIC RIM

SIR CHARLES COTTON

IN A DESCRIPTION of the geomorphology of the Central Range of New Guinea, H. T. Verstappen (1960*a*) has drawn attention to the extreme youth of these mountains. Not only has their present-day high altitude been very recently attained, but even their initial upheaval seems to date not very far back. In contrast with the Alps, which are much older, these New Guinea mountains first arose at the end of the Pliocene period; Verstappen infers this from the age of fringing sedimentary deposits in the southern foothills of the range, these being correlated strata the materials of which were derived by erosion from the mountain mass during and very soon after its upheaval. By the time these "youngest Upper Pliocene beds" had accumulated, erosion had reduced the new mountain range to low relief, and extensive areas of the worn-down land surface then developed and since uplifted are present at high altitudes, though the surface survives only where the resistant nature of the rocks under it has slowed down erosion taking place in a new cycle and has thus allowed of its preservation. In areas of less resistant rocks the highland has been entirely destroyed and replaced by an intricately dissected land surface at a much lower level. This dissection or rejuvenation of the landscape, which must have gone on extremely rapidly and with kaleidoscopic replacement of successive assemblages of land forms, has followed as a consequence of renewed upheaval of the range.

This latter uplift has converted remnants of the first-cycle erosion surface, which had developed at a low level, into plateaus 12,000 to 15,000 feet in altitude, thus making extensive glaciation possible in a Pleistocene episode of world-wide refrigeration. Verstappen claims, however, that in all probability the rising mountain summits did not reach high altitudes until late in Pleistocene time—after the Riss glacial age, that is to say perhaps less than 100,000 years ago. This is because no traces are found of more than one glaciation, presumably of Würm age, though in this "last" glacial age plateaus with a combined area (in the eastern part of the Central Mountains) of about 350 square miles were covered by ice caps. This claim that mountains have arisen so late as to cut out the possibility of any glaciation except the "last" is by no means unique. Such a history has been attributed to the Apennines; and in New Zealand the whole of the uplift and mature dissection of mountains in western Nelson took place, according to Suggate (1957, pp. 24, 61), in the Pleistocene period, and Wellman (1955, p. 39) and others have demonstrated that the Southern Alps have recently been growing rapidly, and are still growing, in altitude.

Verstappen (1957; 1960*b*; 1960*c*) has shown also that tectonic movements on a vast scale have been going on until very recently, and still continue, in the eastern part of the Indonesian archipelago, where portions of anticlinal arcs of the Pacific rim have emerged as islands within the last few thousand years. The conversion of deep-sea floor into islands, even if the islands do not attain a great altitude, involves differential upheaval of the same order of magnitude as that which made the mountains of New Guinea. While warping or folding is obviously in progress in various parts of the North Moluccan and adjacent island arcs (Verstappen, 1960*b*), the most striking evidence of recent movements, of the birth of new lands due to arching up and emergence of the ocean floor, is to be seen on "reef-capped" islands, examples of which are Muna (south-east of Celebes) and some islands in the Moluccas and off the coast of western New Guinea (Verstappen, 1957; 1960*c*).

Though some coral reefs that have since been raised up to considerable altitudes have probably originated as atolls and barrier reefs during former movements of

subsidence and have under them eroded surfaces of ancient land (Davis, 1928, pp. 383–472), Verstappen rejects such an explanation as applied to thinner "reef caps"—carapaces of reef rock that cover some quite large islands. In the case of these growth of coral must have taken place during the initial emergence of the islands, and the foundations of the reefs are not demonstrably former land surfaces but must be parts of a former deep-sea floor; such islands come into existence as a result of "uprise of the area from the tropical seas by tectonical causes" (Verstappen, 1960*c*, p. 3). That the coral-reef carapaces were formed for the most part contemporaneously with upheaval is shown by the presence of very numerous, commonly narrow, raised-reef terraces on the flanks of the reef-capped islands, such a stairway of successively formed reefs leading up to a flat or flattish summit area, the "initial plateau reef cap". On Muna Island such a plateau—the first coral reef that formed on an emerging anticlinal crest—is present, because of more recent tilting, at various altitudes up to nearly 1500 feet.

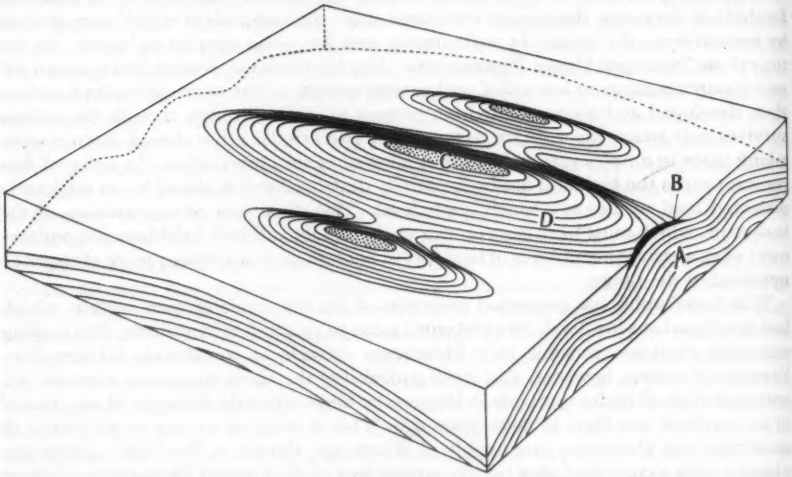


Fig. 1. An infantile tropical island of anticlinal upheaval, as exemplified by Key Minor Island. A. anticline of upheaved sea-floor sediments; B. "reef cap" or carapace; C. "initial plateau reef cap"; D. "terraced reef cap" of "reef ring" type. (Quoted terminology after Verstappen, 1960c, pp. 17, 18)

The majority of islands have been formed by the drowning of land surfaces with maturely dissected or minor tectonic relief, while some have been separated from mainland masses and from other islands by fault-block movement and others are the summits of submarine volcanoes; but another important category must be recognized, formed by tectonic upheaval of the sea floor that is largely anticlinal, though there must be some fault-block uplift also.

The completely reef-encased condition is obviously an indicator of the infantile stage of development of tropical islands thus upheaved (Fig. 1), an infantile stage that is not in this case ephemeral but is prolonged appreciably by the resistance the coral reefs of a growing carapace offer to contemporaneous erosion of the nascent land. Islands that have been long emergent, however, especially if they have attained considerable altitude, will have had the coral-reef carapaces of their infancy stripped off by erosion. It is easy to picture sequential stages of youth and maturity. Early youth will be characterized by incipient and partial removal of the carapace; in late youth, or adolescence, it will be nearly all gone—the "relic reef cap" stage of Verstappen (1960*c*, p. 20). By the time such an island is mature, however, it will not only have lost its reef cap but

will be maturely dissected. Except that it will normally enjoy the protection from marine erosion that is afforded by fringing reefs of coral, it will then be indistinguishable from a maturely dissected extra-tropical island of tectonic upheaval.

An example of an infantile tropical island of anticlinal upheaval is Key Minor, in the Moluccas, with an area of 250 square miles. Its reef cap is a continuous carapace that is but little eroded, and the island margin is embayed (*cf.* Fig. 1), preserving the initial outline of a partly emerged anticlinal crest that was wrinkled by minor folding, during its upheaval but while it was still submerged (Verstappen, 1960*c*, Fig. 6). The crest has attained an altitude of 400 feet since its emergence in the very late Pleistocene.

Verstappen, indeed, dates as late as this the birth of larger and higher reef-capped islands also, basing his argument on absence from the reef caps of features, such as unconformities, that could be attributed to "interglacial rises in sea level" and concluding that the reefs that form most reef caps are entirely of Würm age "or even more recent days" (Verstappen, 1960*c*, pp. 21, 24). The very fact that the carapaces have as yet escaped destruction by erosion supports this view. Verstappen, however, envisages the earlier (pre-emergence) stages of the upheaval of an anticline from the floor of the deep sea—later to become reef-capped—as occupying perhaps the greater part of Pleistocene time.

Transitional between the mobile region of eastern Indonesia—characterized by rapid vertical movements of thousands of feet—and the stable Australian shield is the Aru island group on the Sahul Shelf but near its edge. This group as a whole has resulted from a gentle local bulging up of the otherwise flat floor of a shallow sea (Verstappen, 1959).

LITERATURE CITED

Davis, W. M. 1928 *The coral reef problem.* New York: American Geographical Society.

Suggate, R. P. 1957 The geology of Reefton Subdivision. *N.Z. Geol. Surv. Bull.* **56**.

Verstappen, H. T. 1957 Een en ander over het rifpantser van het eiland Muna (Z. O. Celebes). *Tidschr. ned. aardrijksk. Genoot.* **74**, 441–9.

—— 1959 Geomorphology and crustal movements of the Aru Islands in relation to the Pleistocene drainage of the Sahul Shelf. *Amer. J. Sci.* **257**, 491–502.

—— 1960*a* Preliminary geomorphological results of the Star Mountains expedition 1959, central Netherlands New Guinea. *Tidschr. ned. aardrijksk. Genoot.* **77**, 305–11.

—— 1960*b* Geomorphological observations on the North Moluccan–Northern Vogelkop island arcs. *Nova Guinea*: No. 3 "Geology", pp. 13–37. Leiden: J. Brill.

—— 1960*c* On the geomorphology of raised coral reefs and its tectonic significance. *Z. Geomorph.* **4**, 1–28.

Wellman, H. W. 1955 The geology between Bruce Bay and Haast River, South Westland. *N.Z. Geol. Surv. Bull.* **48** (2nd ed.).

OVERPOPULATION AND OVERSTOCKING IN THE NATIVE AREAS OF MATABELELAND

J. R. V. PRESCOTT

SCOTT HAS SHOWN that land alienation in some African territories is causing considerable problems of population and stock congestion in the native areas (Scott, 1951; Fair, 1945; Doveton, 1937). These have been perennial problems which, all other solutions failing, have often been temporarily relieved by the extension of the native area into unallocated land. In Southern Rhodesia this palliative has been used three times, in 1930, 1950 and 1954. However, it is no longer available since all but 2 per cent of the land has been allocated, and the unallocated land is heavily infested with tsetse fly and has considerable problems of water supply. This situation makes the congestion in the native areas critical, and therefore it seems worth while to examine the nature and extent of the problem in Matabeleland in the light of land classification and agricultural methods, and to record the solutions which are being employed. Matabeleland was selected since it includes considerable areas where the annual rainfall is less than 20 inches and where problems are correspondingly more acute. The field-work was carried out during the winters of 1958 and 1959.

Physical regions and the native areas

Southern Rhodesia is composed of two traditional provinces, Matabeleland and Mashonaland, which are named after the two main tribes found in the area. Matabeleland has an area of approximately 42,000 square miles and is situated in the south-west of Southern Rhodesia between the Zambezi and Limpopo rivers. Over most of the intervening area the Miocene peneplain is well represented, being significantly dissected by the post-Miocene cycle of erosion only near the Zambezi and Limpopo Rivers. The numerous rivers flow over gentle gradients from a watershed of 5000 feet, mostly to join the Zambezi and Limpopo Rivers at heights varying from 1500 feet to 2000 feet. Exceptions are the Nata and Tiriga Rivers which flow towards the Makarikari pan in Bechuanaland.

It has been recognized that "rainfall is the most important factor affecting both crop and animal production in the Central African Federation" (Engledow, 1950). Accordingly in the following brief description of physical regions in Matabeleland, effective rainfall and the length of the growing season have been used as two of the criteria for regional division. The figures for effective rainfall were calculated according to the formula devised by H. L. Penman (1948). Since it has also been recognized that livestock production forms a most important part of agriculture in Matabeleland (Staples and Murray, 1951; Wellington, 1953), the regional division takes account of the grazing quality of the veld (Fig. 2).

The classification according to effective rainfall and growing season gives three physical regions. Region 1 has either less than 9 inches effective rainfall per year or a growing season of under 75 days. These climatic characteristics mark the limits of crop production without irrigation. This region is best suited to extensive ranching based on veld grazing, since the conditions are too uncertain even for drought resisting fodder crops. Region 1 is located in the Limpopo valley and the area drained by the Makarikari pan. Region 2 has 9–14 inches effective rainfall and a growing season of 75–95 days. Within this region drought-resistant grain and fodder crops can be grown with some expectation of success. Accordingly the region is best suited to semi-extensive beef production, with arable production aimed mainly at providing cattle-feed reserves for winter and drought years. Region 2 is continuous and has its greatest extent in the Zambezi valley. Region 3 has an annual effective rainfall of more than 14 inches and a growing season of more than 95 days. The area is still subject to

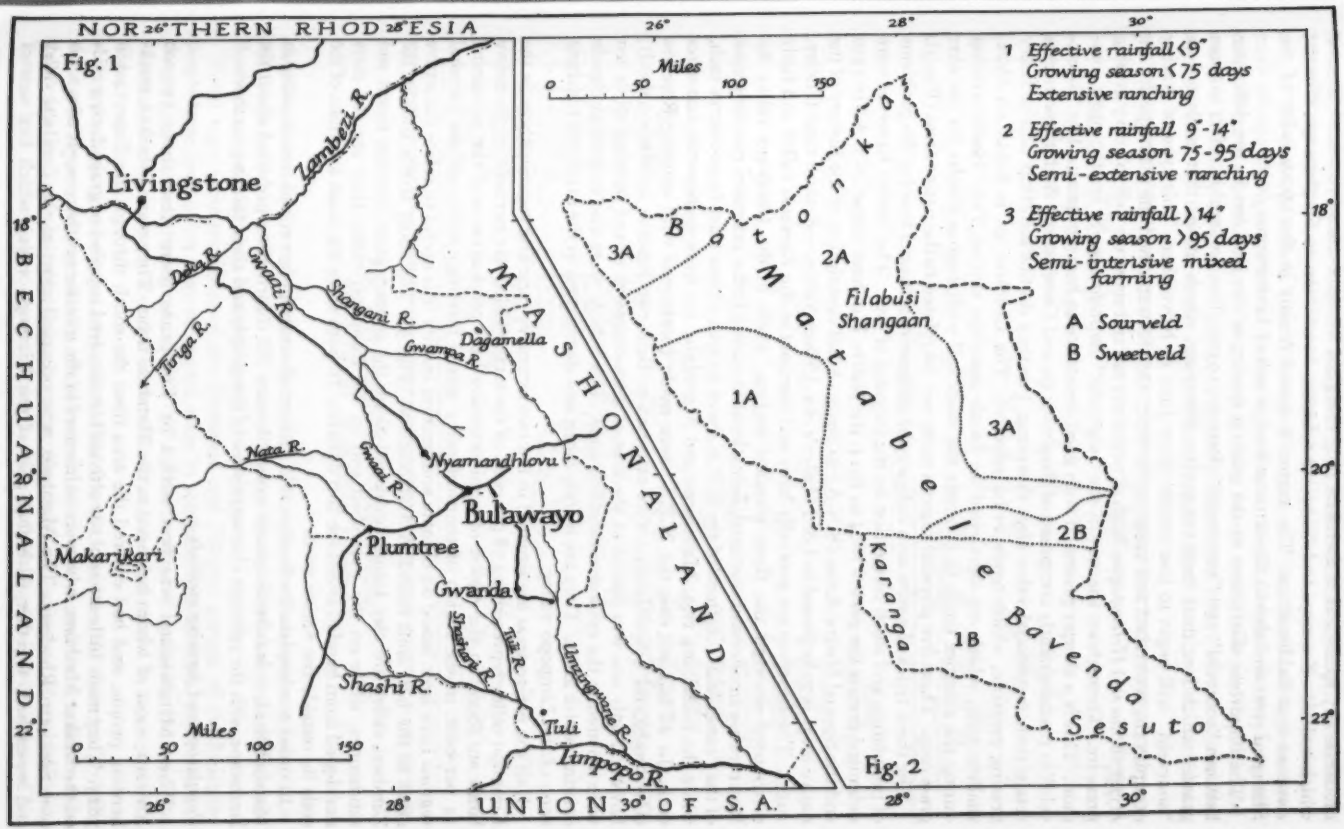


Fig. 1. Matabeleland

Fig. 2. Physical regions of Matabeleland

moderate dry spells and is therefore only marginal for semi-intensive mixed farming which includes *Zea mays* and *Nicotiana tabacum*, in addition to *Sorghum sp.*, *Eleusine coracana* and fodder crops. The region is found mainly in the upper valley of the Shangani river and also in the extreme west, south of Livingstone.

The important distinction in the grazing quality of the land lies in the difference between "sourveld" and "sweetveld" (Rattray, 1957). The "sourveld" refers to those grasses which lose their food value after flowering, which means that cattle fed on "sourveld" will begin to lose weight from June to November. This type of grazing occupies the watershed and areas to the west. On the watershed the main species are *Hyparrhenia* and *Heteropogon*, both of which are tall and stand up well to heavy grazing pressure. Throughout the rest of the "sourveld" *Aristida* species are the most common. This is a shorter perennial with good resistance to heavy grazing. The "sweetveld" is predominantly composed of *Eragrostis sp.* and *Cenchrus sp.* Both these grasses retain their nutritional value after flowering, but they do not stand up well to heavy grazing pressure, which tends to be selective. The *Cenchrus sp.* is found on black, shallow soils, which are developed on basalt outcrops east of Tuli. Heavy grazing during the summer tends to compact the black soil with serious results for the next grass crop. These five physical regions must now be related to the native areas (Fig. 3).

The three types of native area indicate the successive attempts to solve the problems of population and stock congestion by the increase of area. The Native Reserves were delimited during the period 1894 to 1914, the Native Purchase Areas (N.P.A.) in 1930 and the Special Native Areas (S.N.A.) in 1950. A full description of the history of the native areas is to be found in Lord Hailey's *An African Survey—Revised* 1956 (Hailey, 1957). The Reserves are generally large and compact in the Zambezi valley and fairly distributed amongst the three physical regions, while in the Limpopo valley the Reserves are smaller and scattered, being located mainly in the extensive ranching zone of the "sweetveld". Fifteen of the N.P.A. have an area of less than 60,000 acres each, while the remaining two, Maitengwe and Mpimbila, are from 75,000–100,000 acres each. In all but one case the N.P.A. were made contiguous with existing Reserves (Gwatemba and Ghodhlawayo were attached to Belingwe Reserve in Mashonaland); however, only one was placed in the area of semi-intensive mixed farming while ten were situated in the extensive ranching zone. The S.N.A. were also created alongside existing native areas. They are mainly large, and distributed in the extensive ranching zone of the Limpopo valley.

Half the native areas are situated in the two extensive ranching regions, those in the Limpopo valley representing 38 per cent. of the total. Thirty-six per cent. of the native lands are found in the region of semi-extensive beef production and the remaining 14 per cent. in the region of semi-intensive mixed farming. Although the physical regions have been based on climate and grazing quality it is useful to relate the native areas to the best soils found in Matabeleland (Fig. 3). The most fertile soils in the Zambezi valley are clay loams developed along the contact zone between basalt and sandstones, while on the watershed and in the Limpopo valley they are red clays developed from banded ironstone and dolerite. In both cases the main locations of the soils lie outside the native areas.

In order to complete the background picture of overpopulation and overstocking in Matabeleland, it is now necessary to supplement the information provided about the landscape with the relevant characteristics of the people and their farming methods.

Population and farming methods

When Matabeleland was first settled by Europeans there were about 500,000 Africans, most of whom belonged to the Matabele tribe. They were a warlike, stock-herding people, and had entered the area from the south through the Transvaal in 1823. They made little attempt to cultivate but acquired supplies of grain during raids on the weaker Mashona, who were cultivators in the moister northern areas of what is now Southern Rhodesia. The Matabele, who occupied most of the Zambezi valley and watershed, together with that part of the Limpopo valley which lies west of

Gwanda, also raided the neighbouring tribes in Matabeleland for cattle and slaves. Three of these tribes were also stockherders and lived in the Limpopo valley south and east of the main Matabele area. Between Plumtree and the Shashi river there were small groups of Karanga whose parent tribe live in Bechuanaland. In the Limpopo valley lived the Bavenda and Sesuto tribes. The fourth small tribe in Matabeleland was the Batonka, a primitive group of fishermen and cultivators who occupied the riverine areas of the Zambezi valley. These vague tribal distributions have been

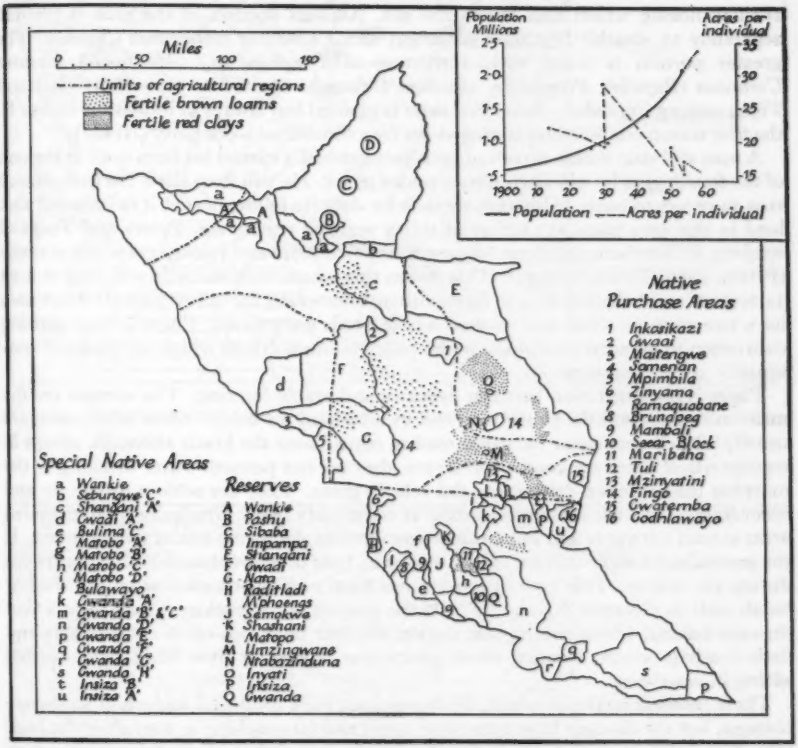


Fig. 3. Native areas in Matabeleland
Fig. 4 (inset). Population growth

crystallized within the native areas since 1894. Thus the Bavenda are found mainly in the Gwanda S.N.A. "H" and "F", the Karanga in the Raiditladi and Mphoengs Reserves and the Batonka in the Wankie native areas.

Since 1951 some members of the Shangaan and Filabusi groups of the Mashona people have been taken from congested areas in southern Mashonaland and settled in the underpopulated Shangani S.N.A. "A". The traditional antipathy between the Matabele and the other tribes is a factor which must be considered in any redistribution of population.

The pacification of the country meant that the stockholders had to begin growing their own grain, and gradually they became herders and cultivators. Each tribe developed its own agricultural method but they were all variations of the following theme. It is interesting to note the similarities of these methods with those of the

Bemba described by Dr. Audrey Richards in the *Journal* three years ago (Richards, 1958).

The chief allocates arable land to the headman, who in turn allocates it to the kraal chief, who in turn allocates it to the individual families. The men clear the trees leaving only fruit trees and trees with ritualistic significance. Thus *Uapaca kirkiana* (*Muhobohobo*), and *Parinari curatellifolia* (*Muhacha*) were left for food and *Gardenia thunbergia*) for ritual. The ground is broken by hoeing and then just before the first rains the felled trees are burnt. After the first rains the seeds are sown and covered by a shallow hoeing which also buries the ash. A small portion of the area is planted separately to *Arachis Hypogaea* (*Nzungu*) and *Voandzeia subterranea* (*Nyimo*). The greater portion is sown with a mixture of *Sorghum sp.*, (*Mapfunde*) *Eleusine Coracana* (*Rupoko*), *Pennisetum spicatum* (*Munga*), *Curcurbita pepo* (*Mapudzi*) and *Vigna eatjang* (*Nyemba*). Some *Zea mays* is planted but always in individual holes. In the first season one weeding is carried out by a communal work party (*Nimbe*).

A man will start with 2 acres and each year gradually extend his farm until at the end of the fourth year he will have 4 acres under crops. He will then allow the first cleared area to revert to bush. Although there is no definite fallow period it is believed that land in this area takes an average of thirty years to regenerate. Peters and Trapnell working in Northern Rhodesia suggest thirty-five years and twenty years respectively (Peters, 1950; Trapnell, 1953). This means that a man with one wife will need at least 34 acres of arable land if he is to farm without shortening the fallow period. Most men have two or three wives and so their arable needs are greater. There is thus shifting cultivation in all areas except the moist valley bottoms (vleis) which are cropped continually under *Zea mays*.

There is no integration between livestock and arable farming. The women are the main cultivators and the young men and women herd the cattle. Since settlements are usually located near water the cattle tend to remain near the kraals although, except in regions where there are known carnivores, they are not penned. After drinking in the morning the cattle are driven into the veld to graze. They are seldom driven far and accordingly graze the same area until it is completely bare. Gradually these denuded areas extend outwards and soil erosion may develop, following one of two patterns. If the ground is broken either for cultivation or by hoof pressure then deflation may occur during the winter. This type of erosion has been particularly serious on the shallow basalt soils in Gwanda S.N.A. "H". If the ground is not broken it may form a skin through baking, which means that during the first rains run-off is considerable and flash-flooding occurs, creating some spectacular gullies on river bank sand causing silting in reservoirs.

These farming methods would, by themselves, have produced important landscape changes, but the changes have been more rapid and far-reaching as a result of the high rate of population growth (Fig. 4). The graphs reveal that, despite the increases in native land there has been a continuous fall in the area available for each individual to the present level of 16 acres per person. Prior to European occupation the landscape was characterized by a low density of kraals near which there were a few small gardens. The kraals were separated by wide stretches of virgin woodland which provided common grazing and firewood. As the two following examples show, the present pattern reveals a close density of kraals around which are large fields, the intervening areas are usually composed of fallow land, and there are extensive tracts near stock-watering points which have been denuded of all vegetation.

Figure 5 represents a typical section of a native area in the extensive ranching zone, being part of Gwanda S.N.A. "D", which has a great number of granitic residuals in the form of inselbergs. Fields extend to the base of these outcrops and most of the land is under cultivation or is resting from recent cultivation. With so little area for grazing it is not surprising that considerable sections of the river banks have been denuded of vegetation, allowing the partial development of gullies. Recent estimations indicate that this S.N.A. contains twice as many cattle and people than it should. Figure 6 shows a section of the north bank of the river Nata which drains into the Makarikari pan.

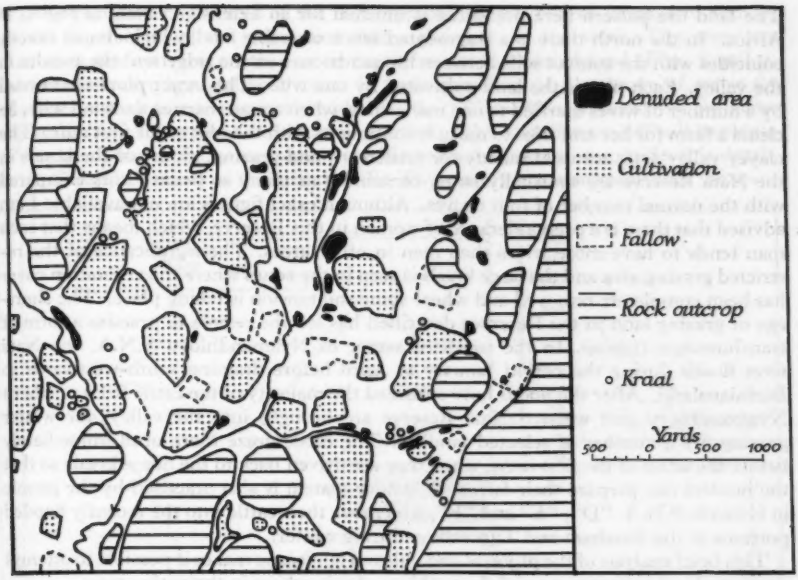


Fig. 5. Settlement and land use pattern of part of the northern section of Gwanda S.N.A. "D"

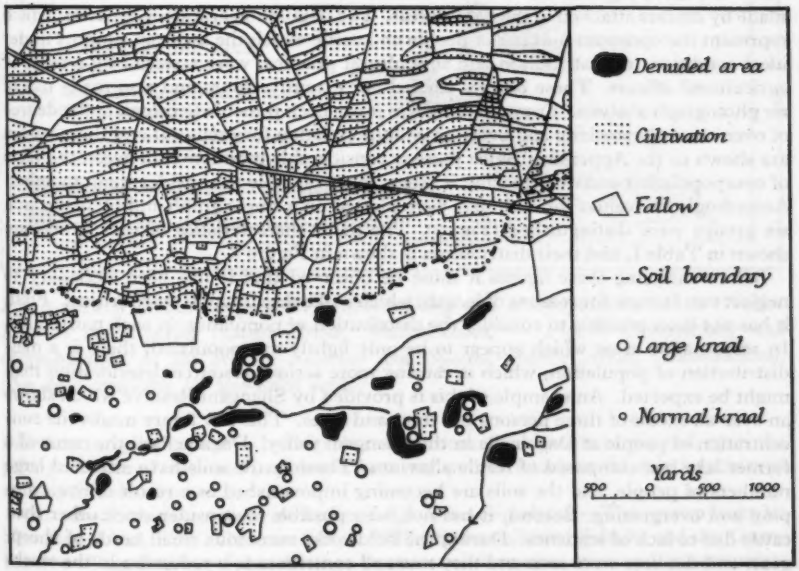


Fig. 6. Settlement and land use pattern of a section of the north bank of the Nata River in the Nata River Reserve

The land use pattern here presented is unusual for an extensive ranching region in Africa. In the north there is a fragmented block of arable land, which almost exactly coincides with the contact soils between the sandstones on the ridge and the basalts in the valley. Each plot is the land cultivated by one wife. The larger plots are farmed by a number of wives married to one man, since, when a man marries a second wife, he clears a farm for her and tries to make it contiguous with the plot of his first wife. The clayey valley soils are used mainly for settlement and grazing. Some of the kraals in the Nata Reserve are unusually large, containing as many as twenty huts compared with the normal number of four or five. Although exact figures are not available I am advised that there is a preponderance of women in this Reserve, which means that each man tends to have more wives than men in other areas. The significance of the restricted grazing area and the large kraals is seen in the zones where the vegetation cover has been completely removed and where some soil erosion is taking place. The shortage of grazing land in the Reserves described has led the people to practise a form of transhumance (*lagisa*). In the southern sector of Nyamandhlovu S.N.A. the Nata river floods during the period January to April before draining south-westwards to Bechuanaland. After the floods have subsided the majority of the cattle from northern Nyamandhlovu and western Nata Reserve are brought into the valley, for winter grazing, by a number of selected families. The cattle graze there until immediately before the onset of the first rains, when they are driven back to the home kraals so that the herders can prepare their farms. A similar system is also practised by the people in Gwanda S.N.A. "D", "E" and "F", who move their cattle into the recently flooded portions of the Shashani and Tuli valleys during winter.

This brief analysis of the physical and cultural landscape makes it possible to attempt a geographical interpretation of the problem of congestion in the native areas.

Population and stock congestion in the native areas

The figures on which the following analysis is based were collected by the Department of Native Agriculture of Matabeleland. The census of stock and families was made by officers attached to the native areas. The population and stock capacity, which represent the optimum number of people and cattle which the area can support under ideal conditions of distribution and agricultural practice, were assessed by a team of agricultural officers. These officers carried out extensive tours and also made use of air photograph analysis. From these figures it has been possible to calculate the degree of over- or understocking and over- or underpopulation for each unit and these values are shown in the Appendix. Since there is considerable interaction between the facts of overpopulation and overstocking it seems most valuable to consider them together. Accordingly the values for each unit were plotted on a single graph and by inspection six groups were distinguished (Fig. 7). The main characteristics of each group are shown in Table I, and their distribution is shown in Figure 8.

Before analysing these figures it must be observed that it has been necessary to neglect two factors, for reasons of length, which make the situation more critical. First, it has not been possible to consider the distribution of population in each native area. In some native areas which appear to be only lightly overpopulated, there is a maldistribution of population, which is causing more serious resource deterioration than might be expected. An example of this is provided by Shangani Reserve which shows an over-all excess of three persons per thousand acres. This low figure masks the concentration of people at Dagamella in the Shangani valley. Dagamella is the name of a former lake bed composed of fertile alluvium. These fertile soils have attracted large numbers of people, and the soils are becoming impoverished as a result of overcropping and overgrazing. Second, it has not been possible to consider stock other than cattle due to lack of statistics. During the fieldwork, numerous small herds of sheep, goats and donkeys were seen and they must all contribute to a reduction in the stock-carrying capacity of the veld.

1. *Areas which are understocked and underpopulated.*—This group includes Gwanda S.N.A. "E" and "F", Wankie S.N.A. and the Wankie Native Reserve, which form

about 11 per cent. of the area of the Reserves and Special Native Areas, and accommodate 5 per cent. of the population and 4 per cent. of the stock. The areas are situated in the extreme north-west and south-east of Matabeleland (Figs. 8 and 3) and have two common characteristics. In each area there is a measure of tsetse fly infestation which is greatest in Gwanda S.N.A. "E", whither it is carried by game migrating from Portuguese East Africa. Further, water supplies are difficult to obtain in Wankie, because the water-table in the Karroo sandstones is at considerable depth, and in Gwanda because of the low rainfall. These areas are unattractive by virtue of

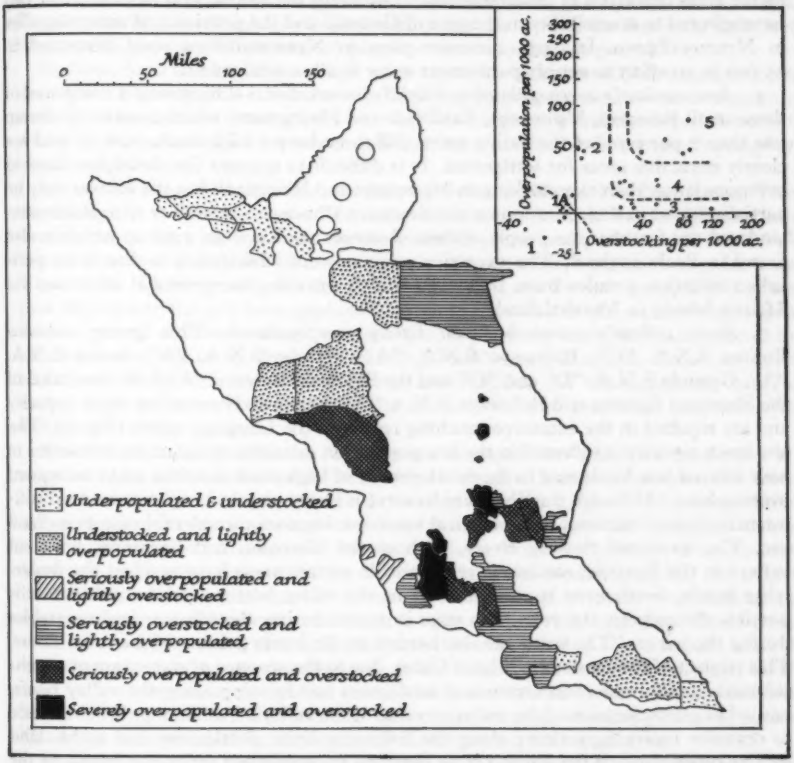


Fig. 7 (inset). Relationship between overstocking and overpopulation in the Native Reserves and Special Native Areas, Matabeleland; Fig. 8. Overstocking and overpopulation in the Native Reserves and Special Native Areas, Matabeleland. (No data available for unshaded areas)

their low carrying capacity. Immigration into them would seem to depend upon the prior provision of stock and population watering points, which could only be achieved at considerable expense.

1A. *Areas which are understocked and lightly overpopulated.*—This group includes Shangani S.N.A. "A", Gwanda S.N.A. "H", Nyamandhlovu S.N.A. and the Gwaai Reserve. Together they form about 34 per cent. of the native areas and accommodate about 23 per cent. of the population and 21 per cent. of the stock. Although all the areas have a low stock capacity, their inclusion in a single group is due to a variety of factors. The Shangani S.N.A. "A" has only recently been developed and it is into this

area that members of the Filabusi and Shangaan groups have been moved. There has not yet been time for the stock density to increase to the stock capacity of the land; it is interesting, however, that overpopulation precedes overstocking in this new area. The Gwaai Reserve has been included in this group, due to the fact that in recent years there have been considerable numbers of cattle deaths resulting from the noxious weed *Dichapetalum cymosum* (*Nkauzaan*) which has appeared in the Reserve. So far as can be determined the cattle deaths have not caused any emigration of population from the Reserve. Gwanda S.N.A. "H" and Nyamandhlovu S.N.A. are closely akin to those native areas described in the first group. The slight overpopulation in these areas can be attributed to accessibility in the case of Gwanda and the provision of water supplies in Nyamandhlovu. In 1959 nineteen pans in Nyamandhlovu were deepened to 15 feet in an effort to supply permanent water to allow settlement.

2. *Areas seriously overpopulated and lightly overstocked.*—This group is composed of three small Reserves, Mphoengs, Raiditladi and Mzingwane, which together make up less than 2 per cent. of the native areas. All three have a high stock capacity and are clearly attractive areas for settlement. It is difficult to account for the higher level of overpopulation than overstocking in Mphoengs and Raiditladi, but the answer may be partially found in their location on the Southern Rhodesian boundary with Bechuanaland and the fact that the people of these Reserves are Karanga, a group which is also found in Bechuanaland. The excessive population of Mzingwane is due to its peri-urban situation 5 miles from Bulawayo, which provides the principal attraction for African labour in Matabeleland.

3. *Areas seriously overstocked and lightly overpopulated.*—This group contains Bulima S.N.A. "C", Bulawayo S.N.A. "A", Matobo S.N.A. "A", Insiza S.N.A. "A", Gwanda S.N.A. "D" and "G" and the Shangani Reserve. With the exception of the Shangani Reserve and Bulawayo S.N.A. "A" these areas have a low stock capacity and are situated in the extensive ranching region of the Limpopo valley (Fig. 8). The low stock capacity is reflected in the low population densities of the units, but seems to have offered less hindrance to the development of high stock densities and consequent overstocking. Although the Shangani Reserve is in the physical region suited to semi-intensive mixed farming, the geological structure imposes considerable limits on land use. The westward flowing rivers, such as the Shangani and Gwampa, have cut valleys in the Kalahari sandstone series and in certain areas have reached the underlying basalt. Settlement is concentrated in the valley bottoms where cultivation is possible throughout the year. *Zea mays* is grown during the summer and vegetables during the winter. The cattle are also herded on the better grazing of the valley floors. This neglect of the sandstone ridges (*Gusu*), due to the absence of water except at considerable depth, and concentration of settlement and farming along the valley floors, has led to a deterioration of the resource value of the valleys. An attempt is being made to organize native agriculture along the following lines. Settlement and arable land will be established on the contact zone between the sandstone series and basalt on the valley sides. During the summer the cattle will be grazed on the *gusu* ridges which will support one beast to 60 acres. With the end of the rains the cattle will be brought down to graze near the settlements for about two months, and then taken to the valley bottoms. After the harvest the cattle will be brought to the cleared fields to graze as long as possible before being returned to the valley floors until the end of the dry season. The high density of population in Bulawayo S.N.A. is a partial consequence of its nearness to Bulawayo.

4. *Areas which are seriously overstocked and overpopulated.*—This group contains Matobo S.N.A. "C", Insiza S.N.A. "B", Gwanda S.N.A. "A" and "B" and the Insiza, Gwanda and Nata Reserves. These areas comprise 14 per cent. of the total native areas and accommodate 24 per cent. of the population and about 20 per cent. of the stock. The Insiza and Gwanda Reserves have a high stock capacity together with high population and stock densities. The remaining areas have low stock capacities but about the same degree of overstocking and overpopulation. Much conservation work is being undertaken in Nata Reserve and during 1959 six dams were built with a total

capacity of 150 million gallons. In addition, fifteen pans were deepened to provide permanent water for settlement.

5. *Areas which are severely overstocked and overpopulated.*—About 6 per cent. of the native areas fall into this group, the particular units being Matobo S.N.A. "D", and Matopo, Shashani, Semokwe, Ntabazinduna and Inyati Reserves. Together they accommodate 15 per cent. of the population and 12 per cent. of the stock. The first four units are located in the Matopos range of hills, which consists of a series of spectacular granite outcrops presenting a bare rounded profile. These outcrops in the case of the Matopo Reserve reduce land available for use to 27 per cent. of the total area. Despite this fact, stock capacity is moderate to high, and since the Reserves have been long established they have attracted people over a considerable period.

Ntabazinduna and Inyati have high stock capacities by virtue of their location on the watershed; however, this is not the only factor accounting for their severe overpopulation. Ntabazinduna is situated only 12 miles from Bulawayo and the Inyati Reserve is placed in the centre of an important gold mining area which offers attractive employment possibilities.

It is not possible to be precise about the position in the Native Purchase Areas. They were designed to be areas where Africans could acquire freehold land rights to a farm varying in size from 50–350 acres. At the end of 1958 the land purchased in the N.P.A. throughout Southern Rhodesia amounted to 1,180,000 acres, with an average farm size of 200 acres. Unfortunately the designated areas were not always unoccupied land and thus the scheme has not been applicable in some areas due to the numbers of original settlers, not all of whom wished, or were able, to purchase land. In Matabeleland the scheme is working in six areas, Gwatemba, Godhlawayo, Zinyama, Samenan, Inkosikazi and Tuli. Accurate information is not available for the remaining ten, but examination indicates that they have the characteristics of areas that are both overstocked and overpopulated.

This review indicates that the development of population and stock congestion is a more complex process than might be imagined. Prior to European settlement it seems likely that nowhere in Matabeleland was there an optimum level of stock or population, although there was no doubt a greater density of settlement on the watershed than in the low veld of the Limpopo and Zambezi valleys. With the creation of native areas stock and population congestion has developed to some extent on all but the poorest land. Eventually, the final stage in all cases will be serious or severe overstocking and overpopulation, and thirteen areas have already reached this condition. There seems to be two ways in which this ultimate condition may develop. On the land with the highest stock capacity overpopulation is at first in excess of overstocking, while on the land with moderate stock capacity overstocking is at first in excess of overpopulation. It has also been noticed that location near manufacturing or mining centres, such as Bulawayo or Inyati, is a significant factor in accounting for congestion.

Having considered the nature and extent of the problem of congestion it is now necessary to examine the attempts which are being made to reduce its severity and incidence.

Solutions to the problem of congestion in the native areas

Some of the local attempts to minimize the problem, such as the provision of increased water supplies, and the change of farming methods in the *gusu* area of the Shangani Reserve, have already been described. The following account indicates the large-scale solutions which are applicable to all Matabeleland, and will show in which areas these solutions are at present being applied.

In an effort to grapple with the serious situation in the native areas, the Southern Rhodesian government passed the Native Husbandry Act in 1952. This act aims at control of land utilization and allocation, and is intended to promote the efficient use of land in the following ways. First, the Act encourages good husbandry and the protection of all natural resources such as soil and water. Second, stock level is to be limited to the carrying capacity of the veld. Third, the Act prevents fragmentation of

holdings and encourages amalgamation of individual units into larger organizations. Fourth, the Act makes provision for the establishment of town and business sites.

The first stage in the application of the Act is the collection of the data being analysed in this paper. It is on this data that plans are based and their implementation is producing important landscape changes. Arable land is being consolidated into large blocks and contour ploughing is everywhere apparent. Kraals are arranged in regular lines and community centres are provided. In areas where this has been done there is a marked absence of denuded sections of river bank. In Matabeleland the final plan-

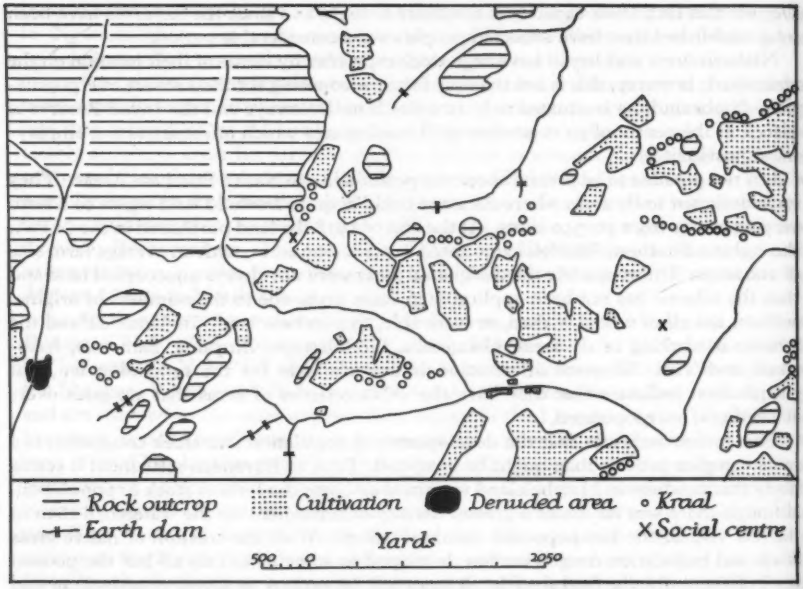


Fig. 9. Settlement and land use pattern of part of the Matopo Native Reserve, where the Native Husbandry Act (1952) has been implemented

ning stage has so far only been achieved in parts of the Matopo Reserve, where the situation was chronic. The accompanying map of part of this Reserve indicates the features of a planned landscape (Fig. 9). The other native areas are being planned along similar lines and priority is being given to those areas where the situation is most serious.

It would appear, however, that the plan alone cannot succeed, for the population and stock estimates on which the plan is being based in Matabeleland show that there are 100,000 people and 111,000 cattle for which no provision can be made. The stock surplus can be dealt with by compulsory destocking over a number of years, but the surplus population make it essential to find supplementary solutions.

A preliminary survey has indicated that there are at least 4500 acres of the Shashi and Tuli river valleys, in Matobo S.N.A. "B" and Gwanda S.N.A. "D", which could be irrigated. Estimating the need of each family as 4 acres of irrigated land, this development would accommodate about 5600 persons. The families resettled in this area will be encouraged to stall-feed one beast for sale to the Cold Storage Commission. The main problem would be to maintain soil fertility under constant cropping. Green manuring is not entirely satisfactory and it may be necessary to subsidize the purchase of bagged fertilizers.

Since the best use of land is extensive ranching it has been suggested that cooperative farms should be established. Herds would be amalgamated and supervised by the most efficient farmers, profits being distributed on the basis of cattle contribution. Investigation into the possibility of such organizations are being undertaken in Gwanda S.N.A. "D", "G" and "F".

It has further been suggested that the use of squatter labour on European farms, coupled with the restriction of immigration by alien Africans, would assist in reducing congestion in the native areas. In 1959 the government introduced legislation prohibiting further immigration of alien Africans into Bulawayo and Salisbury urban districts, in order to combat the effects of slight industrial recession which was causing unemployment. This only affected urban native locations and contributed nothing to the solution of congestion in the rural native areas. It is likely that any large-scale restrictions on labour movement by Southern Rhodesia would produce similar action by neighbouring states, involving the return of Southern Rhodesia's African immigrants. It is to be doubted whether European farms and expanded industrial undertakings could absorb more than a small fraction of the surplus population.

Large-scale irrigation and cooperative farming would seem to offer the greatest contribution to the solution of overcrowding in the native areas, and both will require considerable organization and capital investment.

This paper has described the incidence of overpopulation and overstocking in the native areas of Matabeleland. It shows that, even if all the native areas held their maximum population and stock densities, there would still be a surplus of nearly 100,000 persons and 111,000 stock. The deleterious effects of this situation on the physical resources of the area are noted. The value of the veld is being reduced through overgrazing, which is upsetting the normal balance of vegetation at the expense of the more nutritious grasses. Around waterholes in the drier part of the country, land is being denuded of vegetation, and erosion is occurring, although spectacular gullies are few because of the low gradients. Some waterholes are becoming dry for the first time in living memory, yet there is no evidence of increasing desiccation from the available rainfall records. Finally, the solutions which are being applied to the problem are described.

The implications of the situation do not relate only to the physical landscape. The significance of congestion in respect of the social life of the Africans and the economic life of the country can be readily imagined, and is worth study. However, it is possible that the greatest significance of the situation may lie in its influence on the political concept of "Partnership", which forms the basis of the Central African Federation. Lord Hailey has written that the alienation of land in African territories is "the most powerful influence in determining the character of the relations between the indigenous population and a colonial administration" (Hailey, 1957). The congested native areas are in direct contrast with the underdeveloped European farm lands, and this contrast seems to reduce the possibility that "Partnership" will become an effective reality.

TABLE I

Group	*Area*	*Available area*	*Average stock capacity*	*Stock*	*Excess stock*	*Population*	*Excess population*
	'000 acres		*per 1,000 acres*			*Families of 5 members*	
1	1,059	837	37·3	19,773	−12,637	2,531	−1,513
1A	3,195	2,828	42·8	108,388	−12,261	10,803	2,948
2	124	120	93·9	12,082	194	2,068	1,114
3	3,122	2,629	51·0	210,549	62,513	13,312	7,699
4	1,251	1,175	74·4	96,697	35,998	11,162	4,554
5	520	391	73·2	62,524	37,731	7,199	5,184
Total	9,271	7,980	—	510,013	111,538	47,075	19,986

APPENDIX 1

S.N.A.	Population capacity	Population density	Excess population	Stock capacity	Stock density	Excess stock
	Per 1,000 acres					
Shangani "A" ..	4·6	4·7	·1	55·6	48·0	−7·6
Bulima "C" ..	7·5	8·5	1·0	50·1	103·4	53·3
Bulawayo "A" ..	19·5	20·2	·7	78·9	110·9	32·0
Matobo "A" ..	3·0	3·5	·5	40·0	163·8	123·8
Matobo "C" ..	4·0	6·1	2·1	53·5	84·5	31·0
Matobo "D" ..	7·4	16·5	9·1	66·5	146·7	80·2
Insiza "A"	12·6	12·3	−·3	62·5	149·7	87·2
Insiza "B"	10·1	13·7	3·6	69·2	93·6	24·4
Gwanda "A" ..	9·3	12·8	3·5	93·4	147·0	53·6
Gwanda "B" ..	9·4	15·4	6·0	93·5	117·8	24·3
Gwanda "D" ..	1·7	3·5	1·8	33·4	64·9	31·5
Gwanda "E" ..	1·7	1·6	−·1	33·3	27·6	−5·7
Gwanda "F" ..	2·0	1·3	−·7	33·5	30·7	−2·8
Gwanda "G" ..	2·0	1·6	−·4	33·4	67·7	34·3
Gwanda "H" ..	1·6	1·7	·1	33·3	28·8	−4·5
Nyamandhlovu ..	2·7	2·9	·2	40·0	32·5	−7·5
Wankie	4·1	2·2	−1·9	42·5	15·3	−27·0

The population figures are expressed in families with an average size of 5 members.

APPENDIX 2

S.N.A.	Population capacity	Population density	Excess population	Stock capacity	Stock density	Excess stock
	Per 1,000 acres					
Matopo	12·0	53·9	41·9	72·1	242·5	170·4
Shashani	7·7	19·2	11·5	81·4	142·8	61·4
Semokwe	3·0	12·9	9·9	58·0	154·1	96·1
Insiza	11·5	15·8	4·3	94·3	143·8	49·5
Gwaai	2·6	4·6	2·0	42·5	41·8	−·7
Gwanda	1·8	5·0	3·2	51·7	82·0	30·3
Shangani	4·7	5·3	·6	58·8	83·5	24·7
Ntabazinduna ..	10·7	27·2	16·5	64·3	155·6	91·3
Nate..	4·4	8·4	4·0	66·7	93·2	26·5
Inyati	17·0	26·0	9·0	97·2	137·9	40·7
Mphoengs	7·3	17·0	9·7	102·4	103·7	1·3
Raiditladi	7·3	15·1	7·8	85·3	87·6	2·3
Mzingwane ..	24·4	33·8	9·4	94·0	97·0	3·0
Wankie	7·4	4·6	−2·8	40·0	25·4	−14·6

The figures for population are expressed in families, with an average size of 5 members

REFERENCES

Doveton, D. M. 1937 The human geography of Swaziland. *Trans. Inst. Brit. Geogr.* 8, especially pp. 47–54.

Engledow, Sir Frank. 1958 *Agricultural policy in the Federation of Rhodesia and Nyasaland.* Report to the Federal Minister of Agriculture by the Federal Standing Committee on Agriculture Production, in collaboration with Prof. Sir F. Engledow, C.M.G., F.R.S., C. Fed. 77, p. 24.

Fair, T. J. D. 1945 The Drakensberg native locations. *S. Afr. geogr. J.* **27**, 65–72.

Hailey, Lord. 1957 *An African Survey—Revised* 1956. Oxford University Press.

Penman, H. L. 1948 Natural evaporation from open water, bare soil and grass. *Proc. roy. Soc.* A **193**, 120.

Peters, D. U. 1950 Land usage in Serenje District. *Rhodes-Livingst. J.* **19**, 14.

Rattray, J. M. 1957 Grass and grass associations of Southern Rhodesia. *Rhod. agric. J.* **54**, 197–234.
Richards, I. A. 1958 A changing pattern of agriculture in East Africa: the Bemba of Northern Rhodesia. *Geogr. J.* **124**, 306–7.
Scott, P. 1951 Land policy and the native population of Swaziland. *Geogr. J.* **117**, 435–7.
Staples, R. R. and C. A. Murray 1951 Farming systems in Southern Rhodesia. *Rhod. agric. J.* **48**, 413–27.
Steel, R. W. 1955 Land and population in British Tropical Africa. *Geography* **40**, 1–17.
Trapnell, C. G. 1953 *The soils, vegetation and agriculture of north-eastern Rhodesia.* Report of the Ecological Survey, para. 143. Lusaka: Government Printer.
Wellington, J. H. 1953 A tentative land classification of Southern Africa. *S. Afr. geogr. J.* **35**, 16–25.

ONE HUNDRED YEARS AGO

THE FOLLOWING extract is taken from "Voyage up the Darling and Barwan", by W. R. Randell. It was read to the Society on 23 April 1860, and printed in the *Journal of the Royal Geographical Society* **31** (1861) 147–8.

The banks of the river from Fort Bourke upwards, including Dunlop's and Rantein's Ranges, abound in a variety of beautiful flowers and botanical specimens. Some parts of the banks are thick with a native melon or cucumber—eaten by the blacks; native oranges also are plentiful, of which they are particularly fond.

I did not succeed in finding any indication of minerals; gypsum abounds in many parts, and the settlers near the barrier ranges seem quite satisfied that plenty of gold is to be found there.

I found the blacks above Mount Murchison numerous, but very quiet and inoffensive. They were terribly alarmed at the steamers, and in many instances ran away altogether. I, however, landed some Mount Murchison blacks that were on board, and sent them on ahead to tell their friends that all was right: this had the effect of inducing many to come on board. After this I had no difficulty in getting them on board, unless they vanished before we could get within hearing. On every opportunity I stopped the steamer and distributed tobacco, &c., among the different tribes, with which they were much delighted; and I have every reason to believe that they will not bolt from the next steamer that ascends the river. The whites were, however, in many instances as much alarmed as the blacks; at Mr. Spence's station at Fort Bourke, particularly, the men were quite terrified at our approach by night, and they mistook the noise of the engine for the war-cry of the blacks; and had prepared for us a warm and vigorous reception in the shape of powder and lead—indeed we were passing the station before they discovered it was a steamer, and so unlooked for and unexpected was a steamer, and so sure were they that the blacks were upon them, that they had extinguished their lights and fires, and so quietly awaited the assault that we were almost past the station without knowing we were near it.

I was received by the settlers on the Barwan with great kindness—they were highly delighted at the sight of a steamer in their waters, and seemed fully alive to the benefits likely to accrue to them from its navigation.

ALEXANDER VON HUMBOLDT: CENTENARY STUDIES

THE CENTENARY of Alexander von Humboldt's death, which fell in 1959, was the occasion of the publication of numerous studies and bibliographical aids covering many aspects of his varied career. One collective volume of essays edited by the Berlin Geographical Society was noticed in this *Journal* (December 1959). This note covers the other centenary publications which have been acquired for the Library. While it is not possible to review each in great detail, it is proposed to give sufficient information to aid students and to indicate the present position of Humboldt studies. References are to the list of books at the end of this note.

Two volumes contain the work of Humboldt himself. Dr. Hanno Beck has collected from contemporary records—books, letters, newspapers and diaries—over 500 accounts of conversations with, or personal impressions of, the great geographer (Beck, H. 1959*a*). Arranged chronologically, these give a fascinating picture of his development from the young, rather delicate and slightly Bohemian student, to the octogenarian doyen of world-wide reputation. This is a stiff test for any man to undergo, and Humboldt comes through it not so much triumphantly as effortlessly. The characteristics which emerge greatly strengthened are the wide range of his interests and contacts, and the inspiration and assistance he gave to his fellow workers. The slim volume edited by Sroka contains a careful selection of passages from his published works and correspondence, again arranged chronologically (Sroka, L. 1959). This makes a good introduction for those coming to Humboldt for the first time. As is proper, it concentrates upon his American and Russian journeys. A useful supplement to this is the volume of plates containing portraits of Humboldt, his friends and colleagues, plates from his travel works and scenes of his activities—a pictorial biography with succinct, informative notes (Bitterling, R. 1959).

Among the critical works the most important is undoubtedly the first volume of the authoritative biography by Dr. Beck, which covers his formative years and the American journeys (Beck, R. 1959*b*). The author, by his intensive studies, not only in geography but also in history, is equipped to provide the first adequate full-length study of Humboldt. Some of the conclusions which emerge from this important contribution are referred to below. Another volume, which to some extent adds to this biography, is on the now familiar lines of commemorative volumes (Deutsche Akademie 1959). A number of specialists provide studies on minor aspects of his life and work—his early experience as a mining official, his contribution to the advance of mathematics, hydrobiology and meteorology. One writer discusses Humboldt's financial affairs, another his relation with the Academy of Mines at Freiberg in Sachsen. Inevitably, these vary in interest, and some of the letters printed *in extenso* are rather ephemeral. Perhaps of more general interest than some of these is the account of the "Humboldt-Stiftung für Naturforschung und Reisen", founded in the year of his death under the auspices of the German Academy of Sciences. The first to receive the award was Georg Schweinfurth, and before the end of the century eighteen other scientific travellers received support for overseas expeditions. The fund lapsed during the inter-war years, but has apparently been separately revived in West and East Germany. Another paper gives a preliminary account of the portraits of Humboldt. Finally the Humboldt-Komitee of the D.D.R. have compiled a bibliography of Humboldt: works printed since 1860, and books and papers in German about him which have appeared since 1900.

Humboldt is one of those personages who grows in interest the more one learns about him, and these works illuminate his personality from many angles. His actual physical achievements were considerable; he was the most widely travelled scientist of his day, and for twenty-five years could claim the altitude record on the earth's surface

(on Chimborazo); it was a contemporary quip that Humboldt had travelled the furthest, Gay-Lussac the highest (in a balloon!) and von Buch the deepest (down a mine). Then there was the range of his friendships, from King William of Prussia to Simon Bolivar, the South American patriot. These books emphasize the importance of his intimacy with Goethe, though there was a fundamental difference in their approaches. Goethe was the philosopher brooding over the "whole"; Humboldt the practical scientist seeking to understand the facts about the elements making up the whole. There seems an inevitability about Humboldt's training for his later career; the formative years as a practical geologist, the influence of Georg Forster's vivid recollections of Captain Cook's voyaging; the international atmosphere of Göttingen, and his friendships in Goethe's philosophical circle.

He was indeed always in the right place at the right time. The present writer (this *Journal*, December 1959) expressed the opinion that in some respects Humboldt was "a product of the eighteenth century". He would now consider it of more importance to see him as firmly established among the makers of the nineteenth century, clearly marked off from those of the eighteenth.

As a postscript to this note, it is relevant to record that the Society has recently received a gift with a Humboldt association. The Misses Theo and Arnrid Johnston, great-granddaughters of Alexander Keith Johnston (1804–71) have presented a lithograph portrait of Alexander von Humboldt, after a painting by C. Begas, with the following autograph inscription:

> Je suis heureux de pouvoir écrire ces lignes, un peu hiéroglyphiques sans doute, pour remercier Monsieur Alexandre Johnston de tout ce qu'il a fait pour répandre les connaissances de la géographie physique.
>
> Le Bn de Humboldt
> à Paris en Mai 1845.

One of Johnston's principal works was the "Physical atlas . . . illustrating the geographical distribution of natural phenomena . . . Based on the 'Physikalischer Atlas' of Professor H. Berghaus", 1848. This volume is dedicated to "His Excellency the Baron Alexander von Humboldt, at whose suggestion this work was originally undertaken, and on whose profound and varied researches in every department of natural science a large portion of the contents is founded". It may also be recalled that the Society possesses Johnston's large globe which was awarded two prizes at the Great Exhibition: "Johnston's Physical and Geological Globe". This was presented by Mr. R. Keith Johnston in 1915.

References cited

Beck, H. 1959*a*. *Gespräche Alexander von Humboldts* hrsg. im Auftrage der A. von Humboldt-Kommission der Deutschen Akademie der Wissenschaften. Berlin: Akademie Verlag.

Beck, H. 1959*b* *Alexander von Humboldt. Band* 1. *Von der Bildungsreise zur Forschungsreise* 1769–1804. Wiesbaden, F. Steiner.

Bitterling, R. 1959 *Alexander von Humboldt* (Lebenswege in Bildern). München, Deutscher Kunstverlag.

Deutsche Akademie der Wissenschaften, 1959. *Alexander von Humboldt. Gedenkschrift zur* 100. *Wiederkehr seines Todestages*. Berlin, Akademie Verlag.

Humboldt-Komitee der D.D.R.: *Alexander von Humboldt Bibliographie*. Leipzig, Deutsche Bücherei.

Sroka, L. 1959 *Alexander von Humboldt. Werke-Briefe-Selbsterzeugnisse*. Hamburg, K. Wesemeyer.

G. R. CRONE

THE EXPLORATION OF CENTRAL AFRICA

THE WHITE NILE. By ALAN MOOREHEAD. *London: Hamish Hamilton*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 385 *pages; maps and plates.* 25*s*

THIS BOOK is primarily a political history of the valley of the White Nile prefaced by an account of its exploration. It covers the period from 1856 to 1900 and has a short introductory prologue and a short epilogue. The main work is divided into four parts. "The exploration" covers the period from Burton and Speke to the second journey of Stanley. "The exploitation" deals with the political activities of Samuel Baker and of his successor, Gordon. The latter is the central figure at the close of this part, and for most of the next, "The Moslem revolt". In the fourth part Kitchener dominates the scene. This is not merely an extended biography of these few Europeans. Leading African figures like King Mutesa of Uganda, Tippu Tib and Mohammed Ahmed Ibor el-Sayyid Abdullah, known to history as the Mahdi—to name only three—move in and out of the story in a fascinating way, as do many other explorers and administrators like Gessi, Casati and Emin Pasha. Mr. Moorehead's first-hand knowledge of the country covered by the events he records is fully used in this colourful and splendidly written account of events both in the valley and beyond it.

Much research has gone into this book although most of it is based on the printed records of the participants or well-known historical works. But a number of points which might have been made have either escaped Mr. Moorehead or been thought by him to be not worth making. What follows is therefore not a criticism of this book, which in the best sense of the word is a popular account, but a supplement to it. The prologue is frankly of little use. It jumps, in time, from Ptolemy to the discoveries and reports of the German missionaries in East Africa. James Bruce is mentioned in connection with the Blue Nile but the Portuguese and Charles Beke are not. Nor is it true to say that "the great age of Central African exploration" began with the expedition of Burton and Speke. It began with the journey of Livingstone whose discovery of the middle and upper course of the Zambezi completely revolutionized geographical ideas about Central Africa. Further, W. D. Cooley is singled out as refusing to accept the view that snow-covered mountains existed in East Africa, as reported by the missionaries. He was not alone in this respect. Murchison, then President of the Society, called Livingstone as a witness to white mountains which looked as if they were capped with snow but in fact owed their whiteness to the natural rock. On the other hand, other theoretical geographers, among them the Frenchman V. A. Malte-Brun, saw nothing impossible in this view and pertinently asked why, if snow was found on mountains in South America in a similar latitude, it should not be found in Africa. Cooley also refused to accept the great lake reported and mapped by Erhardt but so did Murchison, MacQueen and Beke, all knowledgeable about Africa, Ritter and Petermann in Germany, and all the leading French geographers. On the other hand what Mr. Moorehead refers to as "a third lake, the Nyasa, further south" was well known to the Portuguese and was accepted by most theoretical geographers including Cooley.

Mr. Moorehead quotes Burton as saying that the Society in its instructions to Burton did not require a search for the sources of the Nile but merely a search for "Lake Ujiji" and a general investigation of the country. In fact, the instructions from the Society were explicit—to look for the "reputed lake", then to go northward to discover the source of the Nile, and finally to return down the Nile or by any other route. It is true that Mr. Moorehead adds in a footnote that Burton was "being a good deal less frank" in this matter. But the whole story is told as if it was Burton's grand idea with which the Society fell in rather than that the Society backed the expedition on its own terms. It was Speke who tried to carry them out. Nor does his account of the quarrel between Burton and Speke bring out any new points.

Similarly, with reference to Stanley's route for the Emin Pasha relief expedition the

whole story is not told. It may be, as Mr. Moorehead suggests, that political considerations and personal wishes determined the route chosen. But in fact the route actually taken was suggested by the Belgian geographer A. J. Wauters while discussion of other suggested routes was going on. He had sound theoretical arguments to support his view, in particular that a large part of the journey could be made by water, that the native tribes so far as was known from previous experience were not hostile to Europeans, and that the journey was likely to take less time than by any other route. Incidentally the initiative in this relief expedition was taken by the Scottish Geographical Society, and the *Scottish Geographical Magazine* contains, in its second volume, an article by Felkin with a map showing the routes proposed by Felkin, Thompson and Stanley—all from the east coast—and "the Congo routes" of which Felkin disapproved.

As one would expect from his previous works, Mr. Moorehead's book makes delightful reading, is well produced and well illustrated. It is, as is claimed on the dust cover, "an enthralling reconstruction of half a century of British achievement, which makes us proud of our Victorian ancestors". J. N. L. BAKER

REVIEWS

EUROPE

THE NEW FOREST. By JUANITA BERLIN and others. Foreword by Lord Radnor. *London: Galley Press*, 1960. 8 × 5 *inches*; x + 201 *pages; maps, plans, illustrations*. 30*s*

This disappointing book is reminiscent of the late nineteenth century topographies. But such treatment is unacceptable in the twentieth century, and particularly when applied to an area such as the New Forest, which is one of the nation's greatest natural treasures and on which so much work has been done by specialists in various fields. The contributions do not fit into any over-all scheme, and the quality of them varies to such a degree that some could have been omitted without loss. There is an excellent account of the Commoners and their rights, though scant attention is paid to the dual administration that is a necessary feature of local government in New Forest affairs. A brief reference is made to the unique New Forest Atlas. This priceless document consists of seven volumes of 1:2500 sheets on which every holding to which rights are attached is marked, together with a record of the rights exercisable.

In a work of this nature one would have expected a fairly full treatment of the geomorphology, and of the distribution of the distinctive Forest soil types and of the remarkable vegetational pattern that has evolved through the centuries in its relation to topography and geology. Instead, geology is dismissed in four pages while as a part of the same chapter, more than twelve pages are devoted to pure floristics. In another part of the book there is a rather entertaining and informative contribution on medicinal herbs. The fauna of the Forest is covered by a section on wild mammals and another on birds. The part dealing with the history, distribution and hunting of deer is adequate and competent. For the remaining mammals, except the squirrels, there is virtually nothing that relates them to the New Forest as distinct from the country as a whole. Little emphasis is placed on the type of habitat or the localities in which they are found or are most numerous. The badger is recorded as "not common" although Neal (*The badger*, Pelican Books, 1958) writes "In the New Forest area of Hampshire they are very numerous, and some of the sets are extremely large". Birds are dealt with in a very unbalanced contribution; four pages out of thirteen are devoted to one species and the other nine pages to 150 species! The photographs of birds are very good.

There are two excellent studies. One on 'Perambulation today' reveals an intimate knowledge and love of the Forest itself, and its tracks and streams, footpaths, heaths and inclosures; it exudes the very atmosphere of the New Forest. The other—Edlin's

account of silviculture—is clear, authoritative and interesting. Starting with the natural woodlands, he goes on to discuss the effects of the right of estovers and the subsequent coppicing and pollarding. He then deals with the great timber plantings, 1698–1848, and leads on to the inclosures and to modern advances in silviculture.

There are three poorly produced maps, though the one showing distribution of deer by species is accurate. There are numerous illustrations, but many of them are poorly reproduced and do not contribute in any way to an appreciation of the New Forest. There is no index. L. E. TAVENER

THE SOILS ROUND KELSO AND LAUDER. By J. M. RAGG. Memoirs of the Soil Survey of Great Britain: Scotland. *Edinburgh: H.M.S.O. (for the Department of Agriculture for Scotland)*, 1960. 9½ × 6 *inches; 201 pages; 2 folding maps, Sheets 25 and 26 of O.S. of Scotland; plates, diagrams.* 35*s*

This memoir and two maps comprise the results of the soil survey of the North Borders—South Berwickshire and North Roxburghshire—completed in 1956. There is a short but adequate survey of the physical environment of climate, geology and physiography, and sections describing the vegetation, agriculture and forestry, which together present an admirable general introduction to the geography of the area. Several sections are devoted to explanations of the principles of soil mapping and classification and the meanings of the terms used in describing soil profiles—the type exposures of the soil mapping units—and discussions on the major groupings of profiles into units such as Podzols, Gleys, etc., illustrated by colour plates of typical profiles. These are followed by detailed descriptions of the soil series represented on the maps with comments on their formation, distribution and interrelationships, supported by the results of chemical and mineralogical analyses.

In conformity with the practice of the Soil Survey of Scotland, series formed on similar parent material, but differing in drainage or "site" characteristics, are grouped into associations. The associations often closely match the physiographic subdivisions of the landscape, and achieve the status of broad landscape units in many ways comparable to the tracts earlier proposed for other parts of Scotland by Linton and Snodgrass (1946). Within an association the local distribution of "sites" (or ecological niches) is broadly indicated by the pattern of distribution of its constituent soil series. The distribution differs in character from one association to another, and it is most illuminating to compare the radically different patterns of colour of, e.g., the till plain of Lower Tweeddale with that on the shales and greywackes of the Gala Uplands.

Inevitably the soil series themselves are by no means homogeneous. Thorp (1947) has already discussed this point with reference to the series of the Soil Survey of the United States. It results in part from the problems of scale, to which the authors draw attention, but even so the results of analyses on soil profiles (e.g. the Linhope series), presumably sampled as being typical of their series since there would be little point in analysing atypical profiles, indicate the inevitable and substantial variation within areas mapped as one series. The series should perhaps best be considered as a sub-unit of the landscape pattern at a sufficiently low level of abstraction for its constituent parts to respond in more or less the same manner to agricultural practices—but nevertheless containing substantial variations about the defined modal profile, the variations being in the same sense as those of the association or tract as a whole. One may at least infer that the distribution of heterogeneities—or micro-habitats—within the series of a single association will be on a pattern characteristic of the association, and to this extent defined by the descriptions of the series and of the associations as a whole.

The reviewers of an earlier soil survey memoir (Wooldridge and Henderson, 1955) drew attention to the substantial number of soil series employed, in that case twenty-five, and expressed alarm at the extent to which excessive seriation might make the map unusable. However, of the twenty-seven series employed on the present sheets we find that only eleven are not common to the adjacent Jedburgh and Morebattle sheets, and of these several will, no doubt, be found to cover considerable areas of the adjacent

sheets to the north-east, from which we may be reassured that by careful correlation unnecessary duplication of series units may yet be avoided. This being so it is most disturbing to find that in this report no reference at all is made to the published Soil Survey Memoir on Anglesey and the adjacent parts of Caernarvon. Many of the soils described in the two memoirs are developed on the same or closely similar parent materials under very similar climate. The published profile descriptions and analytical results, though considerably less detailed in the Anglesey memoir than in the present report, at least strongly suggest that a number of soil series are common to both areas. The surveys, and the naming of soil series, in North Wales appear to have priority over the North Borders survey by several decades. It will be very regrettable if correlation is to stop at the Border.

P. H. T. BECKETT

Literature cited

Linton, D. L. and C. P. Snodgrass 1946 *Report of the Land Utilization Survey of Britain:* Parts 24–5, *Peeblesshire and Selkirkshire*, p. 409.
Thorp, J. 1947 *Proc. Soil Sci. Amer.* **12**, 445.
Wooldridge, S. W. and H. C. K. Henderson 1955 *Geogr. J.* **121**, 210.

WELSH RURAL COMMUNITIES. Ed. by ELWYN DAVIS and ALWYN D. REES. *Cardiff: University of Wales Press*, 1960. 6 × 10 *inches; 254 pages; plates, maps and figures.* 15*s*

Much of this book is not of direct relevance to the geographer, any more than the regional novel is an immediate source of data to him. But, indirectly, there is much to gain from these four sociological essays, written by natives of rural Wales. Their advantage lies in the sympathetic understanding, the inside viewpoint, the knowledge of the language and yet also the detachment which the four authors show as a result of travel elsewhere. Field studies were variously made during the period 1945–50.

David Jenkins first surveys his own seaside village of Aberporth in south Cardiganshire, generalizing on its religious and irreligious inhabitants. Too much appears forced into the Procrustean test-tube of social patterns; the individual must be an embarrassing entity for such sociology. Surely the individual will contribute but not conform to the pattern? Emrys Jones, in his study on the market town of Tregaron in central Cardiganshire, examines systematically its social structure and the economic development of a small market town in a manner more appealing to the geographer. T. Jones Hughes describes, in an excellent essay, "The social geography of a small region in the Lleyn Peninsula" in North Wales. He emphasizes the material imprint of society on the land, expressed in the distribution of settlements, the lay-out of field and farm, the work in the soil and the impact of transport and marketing upon its life. Finally, Trefor M. Owen makes a penetrating and original analysis of the changing nature of Nonconformist religious life in a country district of Merioneth.

As the bias in this book is frankly sociological, the geographer might wish for more emphasis on place than on folk. It is obvious that these essays are a condensed form of large studies, so that, in places, there appear abrupt changes of topic. Nevertheless, the essays are carefully edited to complement each other and show the world the Welsh heartland as the Welshman sees it.

J. M. HOUSTON

THE CANALS OF SOUTH WALES AND THE BORDER. By CHARLES HADFIELD. *Cardiff: University of Wales Press; London: Phoenix House*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 272 pages; maps and plates.* 30*s*

Mr. Charles Hadfield is doing for the inland waterways of this country what Hamilton Ellis has done for the railways. His *British Canals: an illustrated history*, first published in 1950, has gone into a second edition, and his *Canals of southern England* was published in 1955. His flair for research and his capacity for making detailed and sometimes tedious history into a readable text lead one to hope that the present volume will not be the last in the series. The intricate canal network of the English Midlands is still crying out for comprehensive treatment.

In *Canals of South Wales and the Border* the author is dealing with some 273 miles of

inland waterway, about 200 of which were artificial (the remainder being the navigable portions of the rivers Wye and Lugg). This represents but 7 per cent. of the 4100 miles of waterway in Great Britain. In their heyday, round about the 1840's, these waterways were carrying each year some 2½ million tons of traffic, and all but 75,000 tons of this was to be found on the canals of the South Wales coalfield area.

In Chapter I the scene is set with a brief sketch of the industrial development of South Wales and the Forest of Dean, and thereafter the treatment is broadly geographical, proceeding from west to east—the Gwendraeth valley, the Swansea and Neath valleys, the Taff, the Monmouthshire valleys, the Forest of Dean and Herefordshire. Much attention is paid to the plateways and railroads which were built to feed the canals with traffic in an area where the physical difficulties presented by narrow and steeply-graded valleys made the kind of canal network which developed in the Black Country, for example, completely impossible. In particular, the great iron-working district extending from Aberdare through Merthyr Tydfil and Ebbw Vale to Pontypool was served mainly by these "tramroads", which fed the furnaces with limestone from Trevil and carried coal and iron north to the Brecon Canal and southwards to the Glamorganshire and Monmouthshire canals or directly to the port of Newport.

The book is not all easy reading, for in the nature of the subject there is such a mass of detail that unless the reader has an intimate knowledge of local topography he may become overwhelmed by the sheer weight of facts. But it is a solid piece of scholarship; there are about 800 bibliographical references, and footnotes as well. The maps are clear, and the photographs well reproduced. S. H. BEAVER

ST. NINIAN'S ISLE TREASURE: A silver hoard discovered on St. Ninian's Isle, Zetland, on 4 July 1958. Notes by Andrew C. O'Dell. Aberdeen University Studies No. 141. Photographs by Alexander Cain. *Edinburgh: Oliver and Boyd for the University of Aberdeen*, 1960. 14½ × 10 *inches; 47 pages; plates and maps.* 10s

This handsomely produced publication makes generally available photographs, most of them at true scale, of the remarkable hoard found in 1958 on St. Ninian's Isle in the southern Shetlands. The find was made by Prof. A. C. O'Dell and a party of students from his Geography Department at Aberdeen University, who had been excavating the site of the ruined medieval church for several seasons. In addition to the photographs, the book contains a short introduction, notes on the objects and extended drawings by Mrs. Eva Wilson. It is therefore a supplement to the detailed account of the excavations and the find which is printed in *Antiquity* 33, 132 (1959) 241–68.

The hoard, described as "the greatest single find of native Celtic art in Scotland", included twelve penannular brooches, seven shallow bowls, a silver hanging bowl, unique in the British Isles, and two objects, perhaps stole ends. The designs show close affinities with the Celtic art of Scotland and Ireland, as seen, e.g., in the Lindisfarne Gospels. The excavated ruins of the medieval church are dated *c.* A.D. 1150. From the way in which the hoard was buried, it is likely that it was hidden hurriedly on the threat of a Norse attack. Owing to the history of the site—use for burials over a long period to within the last hundred years, and the demolition of the church for the supply of stone—the archaeological stratigraphy is confused, but there is evidence of late Bronze Age burial, and of a pre-Norse church. The association with St. Ninian (d. 432), the apostle of Scotland, and founder of Candida Casa (Whithorn), Wigtownshire, is significant. G. R. CRONE

GEOLOGIC EVOLUTION OF EUROPE. By ROLAND BRINKMANN. Transl. by John E. Sanders. *Stuttgart: Ferdinand Enke Verlag; New York: Hafner*, 1960. 9½ × 6 *inches;* vi + 161 *pages; maps, illustrations.* DM 34

Brinkmann's *Abriss der Geologie* is a two-volume study, dealing with physical and historical geology. The present work is a translation of those parts of the *Abriss* concerned specifically with Europe. A chapter is devoted to each geological period (treating the Tertiary as one) with an additional short chapter on the history of European geological science, and with a final summary chapter on the development of Europe.

In each chapter the presentation consists of a short list of researchers principally responsible for our knowledge of the rocks of the period, an account of the distribution of the rocks in Europe (including reference to the variation in facies according to configuration at the time of deposition), an account of the tectonics and of the probable climatic conditions. In view of the length of the whole book, the treatment of stratigraphy is necessarily very short, but it is supplemented by the use of tables, maps and sections. Most of the tables give the succession, and the index fossils in Western and Central Europe, but some include Russia and occasionally North America. The correlations are bold, e.g. the Dalradian is placed mainly in the pre-Cambrian. The tables are not translated and although a key is given, non-German speakers may encounter a little difficulty. The fossils are well illustrated, but some of the maps and sections lack clarity. The book reads like a translation, and as a translation into American rather than English. Some confusion also results from an inadequate punctuation and from the use of abbreviations for compass directions. Despite these criticisms, however, it should form a useful addition to university geographical and geological libraries.

E. M. YATES

FOOD, LAND AND MANPOWER IN WESTERN EUROPE. By P. LAMARTINE YATES. *London: Macmillan*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 294 pages; text figures.* 35*s*

In the spate of books inspired by the present world attention to food and population problems, this is definitely one which must not be overlooked. It is part of a large research project financed by the Twentieth Century Fund to make a survey of Europe's needs and resources, and is to be followed by further volumes. Dr. Lamartine Yates is a master in the handling of statistics and their presentation in both simple diagrammatic form and in concise tables. The book would be invaluable if only for the skill with which it presents the results of many detailed official publications, especially those of the Food and Agricultural Organization (FAO). But it is at the same time remarkably stimulating, not least because it is often novel in approach and highly controversial. The first chapter boldly asserts that Europe faces a new situation: "Labour will be increasingly scarce; land increasingly plentiful . . . there is no sign that the natural increase in population will be anything but very moderate . . . there need no longer be anxiety about food-supplies, even in the most security-conscious countries" (p. 9). Under the broad headings of food, farming, modernization of agriculture, foreign trade and the role of Government the author then proceeds to attempt to prove these revolutionary assertions. There are places where one feels he presents all the right facts but then draws all the wrong conclusions. It is made abundantly clear that the United Kingdom affords such an anomalous picture when compared with any of the countries of Western Europe that it can scarcely be called "European". The early onset of the Industrial Revolution drained the land of rural population almost before it had time to become surplus, as it is today in many parts of Europe. As standards of living rise, it is interesting to see how the pattern of food requirements and farming production approach more closely "anomalous" Britain. The anomalies at present include the large size of farm, the very small percentage (6) of the population engaged in farming, the dependence on overseas supplies and the character of the home diet. At a time when the British farm, by concentration of effort, is ceasing to be a "mixture of zoo and botanic garden" it is strange to see diversification to livestock being advocated on the grounds that it not only keeps labour occupied throughout the year, but on Sundays as well as week-days (p. 190). The rapid march of mechanization in Britain is well known, and we are given the interesting information that this was the first country in the world to register fewer horses than tractors (p. 200). But in view of declining numbers of agricultural workers, is it true to say that "farming here is a business run by an employer using hired staff . . . even . . . in the west . . . the 'business enterprise' type of farm predominates" (p. 109)?

Yates is under no illusions regarding the unsatisfactory nature of so much of the statistical information available and the difficulty of making just comparisons between countries. Whereas British practice is to equate 10 acres of rough grazing with one

acre of improved farm land to get an "adjusted farm acreage", Yates uses the FAO yardstick of 1 of arable equals 2 of permanent pasture and 4 of rough grazing to get "units" of farm land. He admits therefore that his tables have general, rather than specific validity, but his studies lead him to the rosy view that "European farming by 1970 should be producing 30 per cent. more food with 20 per cent. less labour".

L. DUDLEY STAMP

FORSCHUNGEN ZUR DEUTSCHEN LANDESKUNDE. *Remagen/Rhein: Zentralauschuss für deutsche Landeskunde;* Band 111. STÄDTEGRÜNDUNGEN UND STÄDTEBAU IN NORDWEST-DEUTSCHLAND IM MITTELALTER. By ERICH KEYSER. 1958. DM 18; Band 112. STUDIEN IN NORDDEUTSCHEN BUNTSANDSTEINLANDSCHAFTEN. By LUDWIG HEMPEL. 1958. 116 *pages;* DM 9.70; Band 113. DIE WÜSTUNGEN DER INSEL RÜGEN. By KARL LENZ. 1958. DM 14; Band 114. BOTTROP. EINE BERGBAUSTADT IN DER EMSCHERZONE DES RUHRGEBIETES. By ILSE VOGEL. 1959. DM 14.15; Band 115. DIE ERGIEBIGEN STARK- UND DAUERREGEN IN SÜDDEUTSCHLAND NÖRDLICH DER ALPEN. By W. HARTKE and K. RUPPERT. 1959. DM 22.50

Two hundred and fifty separate works, in more than 120 volumes, will shortly have appeared in this famous series, founded in 1885, and devoted exclusively to detailed researches in the geography of Germany. It may be the largest series of learned occasional publications in the field of geography. Of recent years it has been printed in a smarter form with attractive covers, employing the splendid map style and services of the Bundesanstalt für Landeskunde and often enjoying subventions from the Deutsche Forschungsgemeinschaft. The volumes reviewed present the results of detailed research—and a minor masterpiece—display an original outlook, and contain some excellent illustrations, exhaustive bibliographies, and remarkable maps, at a very reasonable price.

Prof. Keyser, an historian, provides the masterpiece on the origins and development of north-west German towns, the climax of a life of geographical research in the examination of the facts about towns and the analysis of maps. He has studied large and small medieval towns in north-west Germany (Lower Saxony and Schleswig-Holstein) paying attention to the origins and development of the town plan. He clearly establishes that towns here may have had a number of nuclear foci and grown together, even though some act of foundation may also exist. They were closely related to their site, enjoyed the protection of a lord and passed later to the control of the citizens. Keyser skilfully discerns the multiple nuclei of towns and, to trace their development, interprets every sign available in street form, the size of building plots, the place-names and documents. Every detail of town development can be followed in the wonderful series of town maps (scale about 1:5000) and town details, the work of a uniquely skilled cartographer, Frl. H. Tode. A student can read here, and trace on the maps, the detailed development of many towns and learn what will assist the study of any western European town either in detail or as a whole. One wishes merely that the maps had a few contours and that more of the house numbers referred to in the text had been inserted.

Hempel's book on the forms seen in the Bunter sandstones of north Germany, a rock series of great importance in Central Europe, succeeds an earlier study on the Muschelkalk, and precedes one on the Keuper. It is an original idea to study a rock series of a fixed age and similar characteristics, though this was attempted by Küster in 1891 in the same series. In a way, the work is a reaction against climatic morphology and hence it relies on an examination of minor and major erosional and depositional forms in the whole Bunter series. The general conclusion is that the Bunter sandstone was changed less than the Muschelkalk during the Pleistocene. The diagrams have the clear-cut quality characteristic of the Bundesanstalt, but the plates are grey, probably because many were taken in winter or in the forest, and because the features portrayed are usually unemphatic.

Lenz, working in Greifswald, has competently filled a blank in the study of "lost settlements". The general introduction to "lost settlement" theory is excellent, but superfluous. The fundamental geography of Rügen is rather deficient. Thus the conclusions seem unrelated to the island's geography. Moreover, too many generally accepted assertions about settlement decline cannot be fitted to local examples. The early Slav settlement that preceded the German immigration is treated without polemic. The settlement changes are well proved and illustrated often by coloured extracts of old maps, some distribution maps, and some rather dull plates. The bibliography is too full of information about the topic in general rather than the specific subject of the book. The study of the Wüstung is now a major research industry and the time has come to re-absorb it into the general geography of rural settlement of which it is a facet. None the less the work is full of precise and living detail, though the intermediate summaries pall somewhat.

Vogel's study, from Cologne University, of the mining town of Bottrop, a social and economic geography of a coal-mining town, is acutely observed, while the maps are of great accuracy and detail. The text is rather dull and pursues an exhaustive series of methodical enquiries. It could have been quite fascinating, and have avoided much tedium, if the book had presented a simple, short and brisk account of Bottrop, with the maps briefly annotated in proof of the conclusions. Printing and paper, after all, must be used with economy in our subject. Nevertheless few towns that depend so exclusively on one industry have received so careful and searching a study.

Prof. Hartke and K. Ruppert present thirty-two maps of monthly quantities and frequencies of heavy rain in south Germany 1936–50. These maps (scale 1:1M) are very beautifully printed to further the studies of soil erosion, a subject which both the authors have long examined. They admit, in their conclusion, that average figures do not give adequate information about individual years, nor about the most destructive storms, and that much additional information is required on depth, frequency and length of frost in the soil. A study of the erosion of soils in various formations is a necessary corollary to this study.

For seventy-five years this series has been marked by the thoroughness and curiosity of the authors whose most competent equipment in natural science, economics and history, is matched by their love of their native land. The volumes under review fall short of this standard in no particular.

D. J. DAVIS

LA CALABRE, une région sous-développée de l'Europe méditerranéenne. Ed. by JEAN MEYRIAT. *Paris: Colin*, 1960. $9\frac{1}{2} \times 6$ *inches;* 329 *pages; maps and tables*

This is the first regional work to be published by the Fondation Nationale des Sciences Politiques on the problems of the Mediterranean countries. The central theme of the book is to describe the efforts of development in a retarded region, virtually a domestic colony of Italy. Calabria was chosen for this cooperative survey because of its isolation and poverty. All the contributors visited the region in 1957–8.

Mme. Anne-Marie Seronde, geographical "assistant" at the Sorbonne, introduces the survey with a short resumé on the physical features of Calabria. Unfortunately, in a section shorter than the editorial preface, she is unable to give a convincing picture of the regional features, and there is little detail apart from some reference to soil erosion. The editor was anxious not to have a geographical survey. In another chapter on "The agrarian reform" she outlines usefully the legislative basis of the current programme devised by the Cassa per il Mezzogiorno.

An economist, Michel de Soultrait, describes the economy in three chapters. More than half the book is concerned with the social and political aspects of Calabrian life. The social background is outlined by René Nouat, a librarian of Nancy University; Paul Lengrand and Joseph Rovan discuss its "custom", with a disappointing lack of data on folklore; Elena Cassin makes perhaps the most original survey on the religious life; and Jean Besson analyses the "electoral geography".

The book is somewhat disappointing. Its aim is not very clear and not all contributors have attempted to make original surveys. But as a summary of much Italian

literature on this popular subject of the "Southern problem" it is useful. The bibliography is extensive, the index is good and there are twenty-one maps. J. M. HOUSTON

ICELAND: impressions of a heroic landscape. By ALFRED NAWRATH, SIGURDUR THORARINSSON and HALLDOR LAXNESS. *Berne: Kummerley and Frey*, 1960. 12 × 9½ *inches; 57 pages text; 40 colour plates.* Sw. Fr. 39

This excellently produced book is intended more for the general reader than the student geographer, but unfortunately its price may put it out of reach of those readers it is best able to serve.

In his preface Halldor Laxness introduces the main themes of Icelandic life which are dealt with in detail by Sigurdur Thorarinsson in the first half of the book. Sigurdur Thorarinsson's text is well balanced and informative. He is at his most fascinating when he writes of Iceland's volcanic history or of the hot springs which could supply immense resources of steam power and chemical deposits, but he writes equally well of the history of Iceland's settlement and ensuing political and economic development. His last chapter is an account of the rise of Reykjavik in a little under two hundred years from a farm and trading-post in one of the least well favoured areas to a modern city and fishing port with 43 per cent. of the island's population.

Dr. Nawrath's colour plates, which form the second part of the book, bear little relation to Thorarinsson's text and are accompanied by a commentary reminiscent of a travel brochure. The choice is not truly representative; volcanic phenomena are given undue prominence and there are three photographs of the Gullfoss waterfall, whereas the island's ice sheets are represented by only one photograph of a minor glacier.

G. R. ELLISTON

GEOGRAPHY OF THE SOVIET UNION: IV. SOVIET INDUSTRY. By VICTOR P. PETROV. *Washington: Victor P. Kamkin, Inc.*, 1960. 8 × 5½ *inches; 102 pages; maps, illus.*

The student of Soviet geography, handicapped by the dearth of reliable, factual material in English, will find a wealth of information in this survey, fourth in a series of monographs on the geography of the Soviet Union. The approach of the author is statistical rather than geographical and use has been made of only a few general textbooks of Soviet economic geography, omitting the many detailed studies of regions and industries. Full advantage has been taken, however, of the range of statistical handbooks now appearing in the U.S.S.R., together with many newspaper references, which make the work highly topical. The industries covered are iron and steel, non-ferrous metals, engineering, chemical, timber, building materials, textiles and food, but the treatment is uneven. Thus the iron and steel industry is considered with great thoroughness (42 pages) but the very important timber industry is dismissed in one quite inadequate page, which ignores the detailed statistical handbook on this industry. The division of the book into chapters and sections is confusing, several of the chapters being in fact sections of preceding chapters. The maps are a major weakness of the book, perhaps due to the method of printing; many of the names are difficult to relate to the appropriate symbol for an industry or mineral deposit. Despite this drawback and despite an approach at times tendentious (for instance, awards for meritorious labour are referred to as trinkets), there is in this book much useful and up-to-date material, available for reference.

R. A. FRENCH

SVUNDNE TIDER I ØSTGRØNLAND. By EJNAR MIKKELSEN. *Copenhagen: Gyldendal*, 1960. 9 × 6½ *inches; 238 pages; plates.* Kr. 24.75

It is sixty years since Ejnar Mikkelsen claims to have "found his place in life when he saw the East Greenland fells" and over half a century since he was introduced to English readers through *Conquering the Arctic* (1908). In the meantime, few can have acquired a fuller understanding of Greenland's icy coasts and warm-hearted people. *Svundne tider i Østgrønland* is the fifth in a series of autobiographical volumes focused on Greenland. The "vanished times" are those which prevailed when Mikkelsen came

as "an unknown man to this unknown land" before the First World War. The nature of the change which has taken place during his working lifetime is implicit in the subtitle "from the Stone Age to Atomic times".

During Mikkelsen's youth, Greenland had already been established as a land of adventure by Nansen. In 1924, a Hague decision formally recognized East Greenland as Danish territory and in 1933 Mikkelsen was sent as *Embedsman* to keep an inspector's eye over its coasts. His task was partly to watch the balance between man (indigenous and intrusive) and natural resources, partly to explore the possibilities of colonizing this winter land with its two-month open water. The East Greenlanders somehow contrived to make "the impossible possible". Outsiders might help by overcoming shortages of food and fuel or by easing the lot of old age, but they also interfered with hunting and fishing and introduced new diseases and distractions. Control and adjustment have become more urgent as a result of Greenland's international transport bases.

Photographs illustrate the contrast between primitive native and civilized exotic elements in the East Greenland scene, e.g. the impressive hospital at Angmagssalik; but a map would help the reader unfamiliar with its shores. For, since Mikkelsen pledged himself to the service of this polar outpost, the Danish Geodetic Survey has produced good maps. And, since he picked a hazardous passage through rock and ice aboard the *Gertrud Rask*, radar has offered its magic aid "like something out of the *Thousand and One Nights*".

W. R. MEAD

ASIA

RUSSIA AND CHINA. By J. V. DAVIDSON-HOUSTON. *London: Robert Hale*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 192 *pages; maps and plates.* 21*s*

The author has chosen an opportune moment for the writing of this book. This is a time in history when the thinking minds of the world watch with care the reactions of China to Russia and *vice versa*. To a large number of these people the book under review is essential reading. The author has had unrivalled opportunities of observing the two countries and he has fully availed himself thereof. The background has been well drawn in and forms a sound basis for the conclusions drawn. The growth of Muscovy between A.D. 1300 and A.D. 1584, as shown in the sketch-map No. 13, will surprise many, but the really exciting part of the book deals with more modern times. The differences and agreements between Russia and China and the infringement of Japan, the parts played by Mongolia, Outer and Inner, Manchuria and Sinkiang are of absorbing interest. Though events have literally chased one another over these areas, there appear to be no inaccuracies and much confirmation of things as they were, things that were by no means obvious to the casual observer.

Interwoven with all the information of Chinese-Russian relations, due attention is paid to the part played by Outer Mongolia, which is well and accurately related. Though there are now "only" about one million Mongols in Outer Mongolia, throughout the ages these subjects and descendants of Genghis Khan and his hordes have played an important part in the history of Eurasia. The maps are useful and informative and your reviewer cannot recommend too highly this thoughtful and reliable volume.

H. ST.C. SMALLWOOD

KARST AND CAVES IN THE CAUCASUS. By MARYANN SHELLEY. *Privately issued: Miami, Florida*, 1956. $11 \times 8\frac{1}{2}$ *inches;* v+274 *pages; maps in pocket.* $5

This monograph is a compilation of information about the karst regions and caving areas of the Caucasus; most of the material was obtained from the Library of Congress. As is well known, limestone regions make up an important part of the Caucasus and these regions have received recently much attention from Russian karst morphologists.

The work is divided into two parts. The first part, "Karst in the Caucasus", deals with a history of karst studies in the area and gives a brief description of the main limestone land forms in their regional distribution. Both the Russian and English names are given for many of the karst land forms and this is particularly valuable.

There is also a brief note on the flora. The second part is called "Caves in the Caucasus". This part describes the chief caves and their locations, under the headings of Western, Central and South Georgia. One or two caves, like the Ablaskira and the Uplis-Tsike, are dealt with fairly fully. Ice caves are also mentioned.

It is evident that to specialists both in karst morphology and in speleology this monograph is very useful; the notes and bibliography of Russian work in the area are particularly valuable. The text is accompanied by two well-drawn black and white maps which show the distribution of the main karst provinces and land forms in the Caucasus and the location of some of the caves. However, the style of the work is somewhat flamboyant and the text also reads as if it were largely a translation without any emendation. For these reasons this useful work is difficult and rather irritating to read.

M. M. SWEETING

THE SABRES OF PARADISE. By LESLEY BLANCH. *London: John Murray*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 495 *pages; maps and plates.* 30*s*

A hundred years ago English Romantics had two exotic heroes, Abd-el-Kader of Algeria and Schamyl of the Caucasus. The fact that one had fought the French and the other the Russians doubtless had much to do with their popularity in England; but they were both remarkable specimens of "the Noble Savage", and it is fitting that the story of Schamyl, long forgotten here, should now be retold. Miss Blanch, however, has set out to do much more than retell one man's story. She has tried to portray the whole Caucasian scene as it was in Schamyl's day, and the Russian scene as well—that Russian Empire of Nicholas I against which Schamyl's tribesmen were pitted and which itself seems so strange and semi-savage in modern Western eyes.

As readers of her previous book, *The wilder shores of love*, will be aware, Miss Blanch is a believer in Oscar Wilde's dictum, that "nothing succeeds like excess". She likes to write of excessive passions of all sorts, and here she has plenty of opportunity. The result is a rich mixture of excessive savagery, excessive tyranny, excessive luxury, excessive debauchery and, at times, almost excessive heroism. Sometimes, indeed, her statements are even more excessive than the facts: she writes of "beech trees nearly three hundred feet in height" in the mountains and of "tropic vegetation" at Kislovodsk and Pyatigorsk, though there is no tropical or even sub-tropical vegetation in these North Caucasian spas, and she describes Schamyl's conqueror Bariatinsky dying at Geneva, "his face turned towards those snowy Alps which, beside the mountains of the Caucasus, must have seemed like sugar-topped toys", though what he saw was Mont Blanc, which is higher than any of Schamyl's mountains in the eastern Caucasus. Altogether, her geographical descriptions are none too clear; and the book would have benefited by a concise geographical and ethnographical introduction, such as the Caucasian chapter in the 1914 *Baedeker's Russia*. Nor is her history always reliable. She apparently believes, for example, that the Crimean War broke out because "the governments concerned were each activated by a fevered bellicosity—war for war's sake", and that the first Afghan War broke out because "the Indian Empire, under pressure from the merchant companies, showed insatiable greed." "Some Russian agents" had offered "to give Russian support against England's ally, the King of Lahore", and "to place the King of Kandahar under Persian protection, at which Lord Melbourne flew into a violent rage and, on the spot, ordered an expedition to Afghanistan"—as to which one can only say, with the Duke of Wellington, "Madam, if you believe that you'll believe anything!"

Nevertheless, the book (though a long one) holds the reader's interest throughout. It is full of varied information, not always very relevant but often very entertaining; its style is vivid (though occasionally florid, and with odd gallicisms such as the use of "cede" for "yield") and the figures of Schamyl and his opponents certainly come to life in its pages. The unromantic reader cannot help suspecting that they come to something even larger than life, but the facts themselves are so extraordinary that the suspicion may be unjust. There are some useful illustrations, including photographs—for Schamyl lived on into the photographic age.

L. COLLIER

NORTH ARABIAN DESERT ARCHAEOLOGICAL SURVEY, 1925–50. By HENRY FIELD with contributions by EVERT ANDRAU, DOROTHY GARROD and ERIC SCHROEDER. *Cambridge, Mass.: Peabody Museum*, 1960. $10\frac{1}{2} \times 7\frac{3}{4}$ *inches;* xiv + 223 *pages; line and half-tone figures; pocket map.*

Dr. Henry Field is well known as an assiduous investigator of the less comfortable regions of the earth in the interests of geography, physical anthropology and archaeology, with emphasis, though not exclusively, on the prehistoric. His chosen area has stretched from the Nile to the Indus; this volume is concerned with his scientific reconnaissances in 1925 to 1928, 1934 and 1950, of the desert areas stretching southwards from Damascus to Ma'an and eastwards from Amman to Kirkuk and Baghdad.

Considering the quantity and diversity of observations and discoveries, the presentation is commendably orderly, and follows a sort of expanded gazetteer pattern which will be of long-term use to present and future explorers. Many of Dr. Field's earlier reconnaissances must rank as primary exploration in a region then singularly little known in any detail, and regarded by many travellers as probably unrewarding for scientific purposes. He has proved that the so-called wastes of the North Arabian and Syrian Deserts, far from acting as barriers to primitive man had, in fact, witnessed incessant human movements across it with all the attendant implications of spread and contact of cultures. An excellent chapter by Dr. Garrod, who analysed the various groups of implements of the Old and Later Stone Ages, carefully recorded as to exact provenance, indicates a prolonged and probably unbroken sequence of cultures, which elsewhere in the Near East have recently been shown by Carbon 14 dating to cover something in the order of +40,000 years. Mesolithic and Neolithic groups continue the story of man's wanderings in the region, emphasized further by stone circles, enclosures, triliths, monoliths and cairns of speculative age. Line drawings of exceptionally fine quality by Mrs. Miles Burkitt illustrate the range of implements.

Appendices deal with Umayyad and other historical buildings, inscriptions, and flora brought back and identified at Kew. Altogether, this is a valuable reference book, which can raise points of discussion outside the scope of a short review.

G. CATON-THOMPSON

MODERN JORDAN. By JUDGE GERALD SPARROW. *London: Allen and Unwin*, 1961. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 180 *pages; illustrations.* 25*s*

This book is valuable for the tourist, and for those who wish to improve their knowledge of the Middle East; logically and simply compiled, it is well written and easy to read. *Modern Jordan* is particularly interesting for those who knew the country prior to 1950. The present reviewer, who served under Glubb Pasha in the Arab Legion during the difficult period which included the Arab-Jewish war of 1948, was enthralled from the first page to the last. Judge Sparrow succeeds in the difficult and not often attempted task of writing as if looking out on the world from the country of which he writes. As he rightly points out, it is not possible otherwise to convey the atmosphere and tradition of a nation, as well as reporting the facts.

The early part of the book deals with the power and influence of the King and the political turmoil which ensued shortly after his accession. The reasons for this unhappy period, lasting about six years, are clearly explained, although the learned Judge omits one very important factor, in the reviewer's humble opinion! This was the almost complete failure by the British Government to appreciate the value of wireless as a means of countering false propaganda. For years during the time of the young King's grandfather, Radio Cairo was transmitting anti-Western propaganda without any let or hindrance whatever.

Jordan's foreign relations are concisely dealt with, and the role and organization of the Army is most interestingly and accurately described, as is the influence of Islam which, unlike religion in the Western world, is a total way of life, involving not only the individual, but the Government itself. Chapters dealing with agriculture and industry, the Bedouins and the refugee problem are all of absorbing interest. There are some excellent photographs, and altogether the book merits the highest praise. D. B. GOLDIE

TRAVEL IN ASIA

At a time when the world is changing rapidly and local differences are being submerged in a drab uniformity of concrete buildings, westernized clothes and the latest radio sets, books such as the three under review, which bring us the atmosphere of lands still vividly themselves, are a useful aid to understanding their problems.

In MANGO SUMMER (*Hodder & Stoughton*, 1960, 18*s*) Cynthia Ellis sees Siam and China through the eyes of youth and gives a light-hearted account of two years in the Far East. Half her book deals with her life and travels in Siam, and the other half with her visit to China. Her descriptions of historic places are so interlinked with the account of the many people she meets that they are most lively. Her journeys are unusual and whether she is travelling by boat on the Mekong or by rail in China the reader never has a dull moment.

PEOPLE OF THE SUN (*Hutchinson*, 1960, 25*s*) gives us another view of Siam, also closely linked with personalities, so that we see the country through the mind of its people. John Blofeld has a special sympathy and understanding for the oriental and, as Prince Chula Chakrabongse says in his foreword, "he has extracted his knowledge from different types of Thais. . . . By using composite semi-fictional characters John Blofeld deftly paints his pictures of Thai life through their conversations and debates." It is altogether a most readable and informative account of Siam.

MISTAPIM IN CAMBODIA (*Hodder & Stoughton*, 1960, 16*s*) is full of information and tells of many people whom Christopher Pym met during his two years' stay. It lacks the lightness of Miss Ellis and the depth of Mr. Blofeld, but still remains a story worth reading by those who wish to know something of how people live and think in Cambodia.

J. E. F. GUERITZ

AFRICA

SAHARA. By GEORG GERSTER. Transl. by Stewart Thomson. *London: Barrie and Rockcliff*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 302 pages; endpaper map and plates.* 30*s*

Since an American translation of Gautier's *Sahara* appeared in 1935 few books on the great desert have been published in English. Gerster is a Swiss journalist, and the translation of his book from the German by Stewart Thomson is not faultless. One sentence at least runs to 150 words and, judging from a statement on page 177 to the effect that some Europeans engaged in oil drilling were being supplied weekly with 101 lbs of meat per head, either the conversion from kilograms is at fault, or Professor Debenham's Kalahari Bushmen must look to their laurels. (However, even this statement fails to rival the felicitous assertion in Gautier's *Sahara* that "laterite in Tibesti could only have been formed in a relatively humid climate from the sub-fossil skeletons of elephants"). The standard work by Capot-Rey has still to be anglicized, and the book under review is no substitute for it. Nevertheless Gerster is well worth reading, particularly by anyone thinking of visiting the Algerian Sahara. He writes from his own recent travel experiences and still more from his conversations with Saharan oil-men, agriculturalists and scientists like Quézel. One chapter is devoted to the paintings of the Tassili des Ajjer, another to the "Nappe Albienne", and the personalities of their discoverers, Lhote and Savernin, are high-lighted. The careers of Conrad Kilian and Charles de Foucauld are outlined. Best of all is the story of the oil-fields. Several old chestnuts are exhibited. The Trans-Saharan railway appears less attractive than ever, the Saharan Inland Sea had been brought up to date with the aid of nuclear fission. Looking to the future the author successfully qualifies his enthusiasm and quotes the salutary advice of Dubief and Cornet: "Stick some confetti on the bare wall of a room and you have a picture of the cultivated areas of the Sahara. Now stick on fifteen or twenty more pieces of confetti and you have an idea of the effect of unrestricted exploitation of the Sahara's water." But, is it really sensible to describe the discovery of fossil soil under Saharan *reg* as a sensational discovery that will undoubtedly prove in the long run no less valuable than the oil and gas beneath the desert? If such is the case, Algerian petroleum resources have indeed been vastly overrated.

A. T. GROVE

FIELD STUDIES IN LIBYA. Edited by S. G. WILLIMOTT and J. I. CLARKE, *Dept. of Geography, Durham Colleges, University of Durham, Research Papers Series No.* 4, 1960. 9½×7 *inches; 123 pages; plates and figures.* 20s

Under a programme assisted by the Rockefeller Foundation, Professor W. B. Fisher and his colleagues in Durham have conducted for some years field studies in various parts of the Middle East. The present volume contains a collection of twelve papers dealing with individual studies in Libya, all but one relating to coastal Tripolitania. Short papers deal with agriculture around Derna, the recent introduction of ground-nut cultivation, the reclamation project in the Wadi Caam, the structure and functions of Garian township and post-Roman denudation changes in Wadi Lebda. Somewhat longer studies cover the ethnic make-up of the peoples of western Tripolitania, olive cultivation in Tripolitania, forestry development, and the soils and the underground waters of the Jefara Plain. The collection is completed by a study of semi-nomadism, and one of the pastoral Siaan tribe. The papers vary considerably in length and detail, some of the shorter ones being little more than notes; but those on the soils and water supplies of the Jefara, in particular, contain much useful information, and in a country so poorly documented as Libya all reliable and up-to-date material is to be welcomed. Students of the area will find useful the extensive reference lists appended to most of the papers, and it is of interest to note that several of the papers are contributed by Libyans. It is to be hoped that Professor Fisher and his colleagues will be able to consolidate and extend their studies, and that with their lead more Libyans will be encouraged to collect and make available basic information about their country.

R. F. PEEL

THE CENTRAL NAMIB DESERT. By RICHARD F. LOGAN. *Washington, D.C.: Publication* 758, *National Research Council, National Academy of Sciences*, 1960. 11×8½ *inches;* viii+162 *pages; maps and illustrations*

This excellent monograph conveys the results of a year's field study in the central Namib by an American geographer well known for his studies in the Mohave Desert, on which he is a recognized authority. The Namib, remote and repellent, is renowned for its extraordinary climate and for the vast wealth—so far only in part exploited—of its diamondiferous beaches: but there has been a marked scarcity of up-to-date and detailed geographical information about it. Dr. Logan's study is confined to the central zone inland from the coastal section centred on Walvis Bay and Swakopmund, but within this representative section it presents a comprehensive and balanced account based primarily on original observation. Meteorological stations were set up at five places spaced out inland from the coast, and the temperature and humidity records obtained, supplemented by the author's other observations and the published data, provide the basis for a lucid and valuable analysis of the remarkable climate: one combining extraordinary equability of temperature, persistently high humidity and almost constant fog, with virtual rainlessness. Chapters follow on the main natural divisions of the area (the coast, the Namib platform and the great sand dune area), the vegetation, animal life, man's utilization of the region and its future possibilities. Of particular interest to this reviewer were the studies of the two coastal townships, and the author's interpretation of the extensive bed-rock plains; the latter being regarded as highly evolved pediments (or pediplains) developed principally by over-all weathering-reduction. The chapter on vegetation is unusually full and detailed for a geographical monograph, and valuable comparisons in many phases of natural geography are made with the Mohave Desert. Dr. Logan's study is clearly and interestingly written and provides an important addition to the literature, not only on this remote and little-known country but on arid lands in general.

R. F. PEEL

NORTHWEST ETHIOPIA: peoples and economy. By FREDERICK J. SIMOONS. *Madison: University of Wisconsin Press*, 1960. 9×6 *inches;* 250 *pages; maps, plates.* $5

Mr. Simoons, who is Associate Professor of Geography in Wisconsin, spent eight

months during 1953–4 in north-west Ethiopia. As a result of his observations he has written an extremely well-informed book on the Begemder and Semyen areas. The book starts with a short description of the natural setting and an account of the historical background of Ethiopia. These two chapters are followed by an account of the ethnic groups of the north-west describing their social life and political organization. The book then deals in turn with their settlement and house types; the characteristics and methods of their agriculture; their cultivated plants; animal husbandry; fishing and hunting; food, cooking and nutrition; crafts and industries; markets and trading; the effect of their activities on the vegetation and soil of these areas, and it ends with a brief but interesting conclusion. The book gives a ten-page list of the references cited and is well indexed. It includes ten sketch-maps and diagrams, and a number of sketches. There are also photographs. These have been carefully selected to show the different aspects of the country, of the native types and of their houses, and of agriculture and animal husbandry. It is a pity that many of these photographs are of poor quality.

This book will not appeal to the general reader, but anyone who is seriously interested in Ethiopia should certainly read it, for it gives a reasonable explanation of the pattern of Amharic life and its effect on the landscape, and a good deal of detailed information about the country. The reviewer, who recently travelled for four months through those parts of Ethiopia described by Mr. Simoons, would have given much to have had this book with him during his journey. He has enjoyed it and profited greatly from reading it on his return.

WILFRED THESIGER

A SHORT GEOGRAPHY OF WEST AFRICA. By J. C. PUGH and A. E. PERRY. *London: University of London Press*, 1960. 8 × 5½ *inches; 288 pages; maps, plates, text-figures.* 9*s* 6*d*

The pace of political change is now so rapid that a regional study must be outdated before it is published. Yet the demand for regional studies of West Africa has never been greater. *A short geography* consists of 260 pages of text intended for students working for O or A level examinations in West Africa, and is one of several texts designed for this rapidly expanding market. Like the others, it is written in a form of familiar "school-book" English yet, despite the use of standard treatment in systematic-physical and human-regional divisions, it contains much that is both original and commendable and could be read with profit by students in the United Kingdom up to at least first year university level. The work comes very near to fulfilling the requirements of the reader wanting a treatment of West Africa in as brief a compass as possible, yet with all the major features of geographical interest. Balance, however, is not entirely satisfactory, for the systematic-physical treatment should be paralleled by attention to systematic-human.

The maps, diagrams, sketches and illustrations are almost all clear, to the point and original. The climatic maps are in themselves a contribution to West African study. Dangers like the use of vegetation terms to classify climatic regions are avoided and there is even a map of major soil groups and a chapter on disease. The chapter on vegetation contains a proper emphasis on the human factor in plant selection and some excellent drawings of trees to familiarize the student with these major landscape features.

In view of current political changes, revision may have to be attempted fairly soon. May this reviewer suggest that some chapters at least on demography, settlement and agriculture be added to complete this valuable study and that, to balance the lengthy accounts of Ghana and Nigeria, some further material be added to the chapters on Senegal, the Ivory Coast, Soudan (Mali) and Upper Volta? Some minor points of criticism are: that one cannot see the "thicker and taller" forest near the Volta in the photograph on p. 153; the use of South African terms like "kopje" (koppie?) and "donga" is of doubtful value; the maps of relative humidity (p. 37) should explain at what times of day the readings were taken; the argument on pp. 252–3 that more dependents will have to be supported each year in West Africa due to natural increase

is normally applied to countries with increasing proportions of old rather than of young people. In any case, in the present condition of West African statistical returns it would be impossible to verify. W. B. MORGAN

UGANDA: a crisis of nationhood. By HAROLD INGRAMS. *London: H.M.S.O.* $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 366 *pages; maps and plates.* 30*s*

This latest volume in the Corona Library fully satisfies the aim of the series to present a "contemporary portrait" of a dependent territory. It is neither a scientific treatise nor an ordered historical account, but a picture of events and places linked not only by general location, but by the theme of developing nationhood in Africa. Harold Ingrams has had considerable experience as a colonial administrator and is an entertaining writer. The work is splendidly illustrated with photographs, including several of great historical interest, and maps. The rapidity of change, particularly under the governorship of Sir Andrew Cohen, the Kabaka's exile and the problems of tribalism in a modern state are well described. Modern developments contrast oddly with those of the early days of colonial rule and there is a telling comparison between two issues of the *Daily Telegraph* sixty-eight years apart. One is perhaps surprised now to read that Sir Winston Churchill once thought that Uganda should be developed by the Government rather than by private enterprise for "it would be hard to find a country whose conditions were more favourable than in Uganda to a practical experiment in state socialism". The accounts of the present political dilemma are penetratingly given and comparison with Ghana shows that nationhood may yet be achieved despite the clash of tribal interests . . . "the moment of truth will come when the people of Uganda feel they have a unity of purpose and can be a nation together". W. B. MORGAN

ERITREA: a colony in transition 1941–52. By G. K. N. TREVASKIS. *London: Oxford University Press for the Royal Institute of International Affairs,* 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 137 *pages; maps.* 21*s*

Mr. Trevaskis, from direct experience, describes the period of British administration in Eritrea from 1941 to 1952 and assesses its impact in terms of the growth of Eritrean political consciousness and the United Nations settlement of its status. In retrospect, the complex problems of the administration can be appreciated. Considering the variety of pressures directed towards upsetting orderly government, it was a notable achievement for a make-shift administration to hold the ring as creditably as it did.

From the aspect of political geography, Eritrea has had an interesting history. As long as the Ethiopian monarchy was centred on the northern part of the country, the Christian part of Eritrea owed allegiance to the monarch. Through it passed the roads to the port of Massawa, northern Ethiopia's outlet to the sea. But the Ethiopians could not tolerate the climate of the Red Sea coast and they allowed the Turks, Egyptians and Italians successively to occupy Massawa. King John IV, after defeating the Egyptians in 1876, and the Emperor Menelik, after defeating the Italians twenty years later, both failed, or were unable, to follow their overwhelming successes to their logical strategic conclusions by occupying Massawa.

Consequently Eritrea became an Italian colony with frontiers that embraced Muslims akin to the tribes of the eastern Sudan as well as the Christians of the highlands. It was this situation that confronted the occupying power in the Second World War with claims, which it could not satisfy, on the whole or parts of the territory by Ethiopia, Italy, Egypt, the Sudan, Eritrean nationalists and Muslim nationalists. The solution had to wait for international settlement after the war had ended, and a solution was long deferred. The compromise finally reached by the United Nations was for the federation of Ethiopia and Eritrea. Mr. Trevaskis gives an arresting account of what the events leading up to the United Nations solution meant to administrators who were trying to provide good government. His close contact with two international commissions that visited Eritrea has a particular interest in view of more recent United Nations tasks in Africa. It was shortly after he finished his book that Eritrea surrendered to Ethiopia most of the limited autonomy in local affairs permitted by the

constitution of 1952. Mr. Trevaskis attached importance to the survival of the Federation in Ethiopia's own interests, as well as Eritrea's. But its demise found the briefest of notices in British papers. DUNCAN CUMMING

NORTH AND SOUTH AMERICA

SIMON FRASER, letters and journals 1806–1808. Edited by W. KAYE LAMB. *Toronto: Macmillan*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 292 pages; maps.* 35*s*

His astonishing journey in 1808, down the great and turbulent river which bears his name, puts Simon Fraser in the first rank of Canadian explorers, but recognition of his work has come slowly. Fraser was a partner in the North West Company which, trading in furs across the continent from Montreal, was looking for a cheap supply route beyond the Rocky Mountains. He carried out instructions to trace to the sea the river whose upper waters Mackenzie had travelled in his journey to the Pacific in 1793 and which was believed to be the Columbia. He found, when he reached tidewater, that it was an entirely different river, flowing into the sea nearly three degrees north of the mouth of the Columbia. Neither this discovery nor all his or his men's courage and perseverance could alter the melancholy fact that the new river was "inconceivably dangerous", rushing with "tremendous whirlpools and Gulphs" between sheer precipices, where it was impossible to stop or put ashore. It was clearly not navigable, even by canoes, and overland travel along its banks meant dangerous mountaineering. Fraser's party had passed "where no human being should venture". It was useless as a waterway to the Pacific Ocean. Moreover, although most of the Indians along the river treated the explorers "very civilly" and, indeed, by their able and generous help enabled them to carry out their "desperate undertaking", the Cowichans at its delta were so threatening that the explorers had to turn back before reaching the open sea.

Fraser's journey did not solve the Montreal fur traders' problem of expansion beyond the Rockies, but his journal makes exciting reading. Dr. Kaye Lamb, Dominion Archivist, has brought to the task of editing it a fund of experienced scholarship. He has made an exhaustive survey of sources, collecting a most interesting group of documents by and about Fraser, which he introduces with a welcome biography, an examination of the background of Fraser's life and work and an estimate of its significance. It is a matter for gratitude that this 150-year-old gap in the literature of Canadian historical geography is now so excellently filled. IRENE M. SPRY

LATIN AMERICA: a regional geography. By GILBERT J. BUTLAND. *London: Longmans*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 373 pages; maps and plates.* 27*s* 6*d*

Readers familiar with Professor Butland's monograph on the *Human geography of Southern Chile* (*vide Geogr. J.* **124**, 4 (1958) 558) have looked forward with pleasure to a general text on South America from the same pen. In his *Latin America*, however, he has chosen a wider area (all of the Americas lying south of the United States) and has written primarily for ". . . VIth form and Training College students and those taking up a study of the continent at First Year University level". Within these limits, pressures of syllabus and price give a writer little freedom of manoeuvre, so that areas where Professor Butland has spent years in residence and research can be spared little more than conventional space.

Latin America is arranged in an interesting manner by way of five sub-continental regions. For each region there is a general introduction followed by separate chapters for the main constituent States. A feature of this arrangement is that it allows more room for discussion of Middle America (nearly one third of the book). The author justifies this bias by arguing that these middle lands fall too often between North and South American stools. Certainly the classic German and French accounts of Sapper and Sorre are old, and one can think of no adequate modern replacement in English; nevertheless, the very brusque introduction to Latin America as a whole and the thin measure meted to Portuguese South America makes this reviewer wonder whether the extra pages on Middle America may not have been bought too dearly. Clearly no

regional arrangement will satisfy all readers and the course steered in this textbook is often arguable but never illogical.

In detail, the treatment of each region reflects the author's special interest. This reviewer found the section on the Pacific Republics most interesting and that on Portuguese America least compelling. To describe an agricultural zone as "extending for over one hundred miles on all sides of the city of Salvador" (p. 305) is an unfortunate slip (the city is bounded by water on three sides), but the conception of the Paraíba valley as ". . . largely a scene of subsistence agriculture" (p. 318) is surely an error. Students using this book may complain of insufficient headings within the chapters, and many maps which give little more data than a standard atlas. Indeed, while most of the plates are excellent (a feature of other texts in this Longmans' series), too few of the maps seem to earn their places.

This new English textbook can hardly fail, however, to find a ready welcome. Professor Butland has written a readable, reasonably priced text which will fill a serious teaching need and is a welcome addition to the few well-worn volumes on this shelf.

PETER HAGGETT

LATIN-AMERICAN MONOGRAPHS

LATIN-AMERICAN MONOGRAPHS is the title of a series of 12,000 to 24,000-word studies in the social sciences which have appeared quarterly since September 1957 under the sponsorship of the School of Inter-American Studies of the University of Florida. Most of the eleven works so far published may be of interest to geographers.

Maurice de Young, in *Man and land in the Haitian economy*, examines the rural economy of Haiti and finds that, contrary to general belief, it is commercial not subsistence; furthermore it is based not on agriculture but on horticulture, which the author defines as the highly intensive, perennial cultivation of fruits, vegetables and root crops without the aid of animals or machines. The preference for horticulture is attributed to Amerindian, Spanish and West African influences, whilst the old-established commercial outlook derives in part from the French heretics who once dominated the country. The wider significance of this study, according to de Young, lies in the implications for other hot, wet lands of a humid, tropical country which is permanently, intensively and successfully cultivated by simple methods.

Edward B. Glick's *Straddling the Isthmus of Tehuantepec* is a straightforward historical description of the various projects to provide modern links between the Gulf of Mexico and the Pacific Ocean. After many decades of failure by American concessionaires, for diplomatic and financial reasons, to complete the projected railway, it was finally put into operation by a British company in 1907. But Revolution, the Great War and the Panama Canal brought the international career of the highly efficient National Interoceanic Railway of Tehuantepec to a premature and unforeseen close.

The coffee frontier in Brazil, by Miss Luella N. Dambaugh, is the least satisfactory, though most purely geographical monograph of the series. The title is misleading: the first part is a half-digested account of the I.G.U. excursion in 1956 to São Paulo and Northern Paraná supplemented by reference to the Excursion Guidebook. The second part examines Brazil's role in the world coffee market and describes the steps taken at different times to avoid flooding that market.

Yukio Fujii and T. Lynn Smith combine understanding with scholarship in *The acculturation of the Japanese immigrants in Brazil*, a useful study which summarizes the history of Japanese emigration to Brazil, the problems of adjustment to new physical and agricultural environments, the social and cultural changes undergone by the colonists and their contribution to Brazilian society.

Notes on Seri Indian culture, Sonora, Mexico by William B. Griffen is an ethnographical study of a group of formerly nomadic fishers, hunters and gatherers who now devote their energies chiefly to commercial fishing.

Economic change in Chile, 1929–59 by Alvin Cohen, like de Young's study, is national in scope and international in significance. A reasoned account of the economic vicissitudes suffered since the Depression is followed by a description of the Chilean

Development Corporation's projects and of the problems encountered. Following Zimmerman, the author holds the view that economic development depends on raising "the levels of the societal and technological arts" (i.e. extending the economic application of scientific and technological knowledge). Since a change in these levels will lead to a change in the relative class positions, the class likely to suffer will resist. Hence Chile's economic stagnation is ultimately the result in part of the reactionary power of the large landholders. But change depends equally on the desire of the underprivileged for advancement—and the *inquilino* (farm-labourer) still accepts his lot. The beginnings of an awakening Cohen sees in the "culture transfers" which are taking place between the industrious German immigrants and the Point 4 Programme Technical Assistants on the one hand and the Chilean community on the other. But these activities are largely confined to the southern provinces. The author does not appear to see a similar awakening in the economic nationalism, of which he is scornful, nor in the concomitant growth of a dissatisfied urban proletariat at the nation's centre.

Other Latin-American Monographs deal with the historian, José Milla; the Chilean National Theatre; the Costa Rican Election of 1953; and the Acción Democrática party of Venezuela.

J. COLIN CROSSLEY

PHYSICAL AND BIOLOGICAL GEOGRAPHY

THE FACE OF THE EARTH. By G. H. DURY. *Harmondsworth: Penguin Books*, 1959. 7 × 4½ *inches; 223 pages; line drawings and plates.* 5*s*

LA GÉOLOGIE. By J. BOURCART. *Paris: Armand Colin*, 1959. 6½ × 4½ *inches; 204 pages; line drawings*

The face of the earth is one more book by a practising geographer/geomorphologist intended to present land forms to the non-specialist. The basis of the arrangement and treatment of the material is rather unusual. It starts with a chapter on rock destruction, which includes a useful summary of mechanical weathering and mass movement, but has inadequate treatment of the chemical weathering that is crucial in many geomorphological processes. There is no account of rocks as such, apart from the occasional mention of a name, e.g. dolerite, or a mineral, albite (complete with formula).

Two chapters on river patterns follow. These are presented in a lively and brisk style. The structure of the earth's crust is introduced incidentally and in places inaccurately, thus where outcrops of folded strata converge (p. 28) it is due not to dying folds but to their plunge. There is a novel and unsupported suggestion that the Lake District drainage (p. 26) originated on a Carboniferous cover. The collapse origin of the Gordale Scar valley is summarily rejected. Although the influence of structure is implied, structural geology is rather curiously referred to under "Conclusions" in the last short chapter as "a most useful accompaniment of geomorphology". A chapter on volcanoes and earthquakes, with some reference to faulting, intervenes before a return to river activity in Chapters 6, 7 and 8. Chapters on marine action, movement of sea level and movement of land follow. Glacial geomorphology occupies three chapters, with a rather undue emphasis on the simple process of the breaching of watersheds.

The general treatment is rather uneven, evidently depending on the author's interest. Some topics receive detailed and advanced theoretical treatment, e.g. misfit streams, while elsewhere principles are illustrated by simple examples which are hardly meaningful to readers unfamiliar with the British scene. The whole effect is, however, stimulating, although possibly in places irritating with its unpredictable fluctuation of standard. It can, nevertheless, be recommended to a wide body of potential readers as representative of much of the best in modern geomorphology. Line drawings are numerous and clear, but occasionally suffer from inadequate explanations of ornamentation and lack orientation. A large and carefully chosen series of photographs constitute a valuable supplement to a concise text.

La géologie, an introduction to the science of the earth by an eminent French authority on sedimentary processes, is also designed for the non-specialist reader. By contrast with Dr. Dury's book the arrangement shows a good French logical approach

in plan and execution. A stimulating introduction on the history and development of geological science (28 pages) is followed by a substantial chapter (77 pages) dealing with material of the crust, which includes concise and clear descriptions of rocks and the processes by which they were formed. As might be expected, the views of the Clermont Ferrand school find their place in dealing with metamorphic rocks. This is followed by a chapter of 31 pages dealing with deformation of the rocks, and a chapter of 53 pages on the history of the earth (stratigraphy).

The whole approach is that of a simple exposition of basic principles with illustrative material drawn from a wide coverage in Europe and beyond. The book can be recommended for British students wishing to develop their familiarity with French scientific writing and at the same time broaden their geological background.

S. E. HOLLINGWORTH

LE MODÈLE DES RÉGIONS SÈCHES: Part 1, Le milieu morphoclimatique et les mécanismes morphogénétiques des régions sèches. By J. TRICART and A. CAILLEUX. *Paris: Centre de Documentation Universitaire*, 1960. $10\frac{1}{2} \times 8\frac{1}{2}$ *inches; 129 pages; line drawings*

This is a clear, systematic introduction to the study of desert land forms. It surveys the erosion processes, and their physical and biological controls, as they affect about one third of the Earth's surface where, because of lack of water, the vegetation cover and soils are too thin to protect the rock effectively against atmospheric action. The processes are shown to vary in emphasis from one dry region to another, according to the rainfall regime and vegetation. This involves a study of certain aspects of the ecology of deserts which is of considerable value in its own right. The authors rely a good deal on recent French work in the Sahara, notably by Dubief on winds and run-off, and refer to several Russian as well as American papers. The bibliography contains about 180 entries, in a few of which authors' names are spelled incorrectly.

Mechanical processes are held to be dominant throughout the dry lands. Considerable importance is attached to insolation weathering, but unfortunately reference is not made to certain American papers indicating its limitations. The criticism of Davis (on p. 79) as being responsible for too much emphasis being placed on wind action does not seem to be very well founded. On the whole, the views expressed accord with the general trend of modern ideas, but it is interesting to find attention being called to the importance of frost action in extra-tropical deserts, to the great effect of slope angle on run-off in deserts, and to the manner in which crusts of weathering break down. The attribution of fossil patina near Mopti to the Ouljien (p. 82) is perhaps unsafe. The authors point to the need for further work on temperature gradients below the surface, the relations between sand-driving winds and dune directions, and the occurrence of loess-like deposits in low latitudes. A brief discussion of the distribution of *ergs* and the way in which water-laid deposits control their morphology is particularly interesting. The fundamental importance of climatic changes is recognized, but a statement on p. 56 that the tropical high pressure systems appear to have shifted towards the equator during the glacial periods carries important implications that require more consideration than they receive here. Finally, it is worth noting that this work is a good illustration of the way modern geomorphology remains a part of physical geography.

A. T. GROVE

A BIOGRAPHY OF THE SEA. By RICHARD CARRINGTON. *London: Chatto and Windus*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 286 pages; illustrations.* 30*s*

Mr. Carrington, already well known for his books on natural and unnatural history (mermaids, mastodons and all that), has now turned his attention to the sea and in this book gives us chapters on every aspect of that greater part of the Earth's surface. He begins with physical aspects of the ocean: the form of its bed, currents and climate, but the greater portion is concerned with the life in the sea and he concludes with chapters on man and the sea. The book is popular in the best sense and, though recent works do not seem to have been used, it is well balanced, clearly and brightly—even gaily—

written. Above all, and especially in the many chapters on marine biology, the author has the rare quality of being able to communicate a genuine enthusiasm for, and wonder at, the creatures he describes. Without being journalistic in the pejorative sense, he achieves a balance in attitude between the scientific and the imaginative, and always there is a sparkle of wit to carry the reader forward. There are many illustrations: very fine half-tones and some not so good line blocks. The book is in no sense a textbook; in spite of its extensive bibliography it is not even a reference book, but it will undoubtedly spread knowledge and stimulate in many a wider interest in the sea and the many and diverse living things in it.

R. MILLER

HUMAN AND HISTORICAL GEOGRAPHY

ESSAYS ON GEOGRAPHY AND ECONOMIC DEVELOPMENT. Edited by NORTON GINSBERG. University of Chicago Department of Geography Research Paper No. 62. Planographed. *Chicago: University of Chicago Press*, 1960. 9 × 6 *inches*; xx + 173 *pages; maps*

In recent years a number of American geographers have taken a keen interest in the problems of economic development and under-development. The publication of this little volume of essays by nine of these geographers is greatly to be welcomed, not least because, in its editor's words, it provides "a broad cross-section of the current interests of [American] geographers in economic development and a representative sample of their real or potential substantive contribution towards that field" (p. xii).

The editor contributes a useful introduction. It is followed by an important methodological essay by Richard Hartshorne, who asks a number of pertinent questions, notably about the relevance, in the study of geographical variations in economic development, of a number of possible yardsticks, from *per capita* income to literacy. In considering the contribution that geography can make to the study of economic development, he concludes that "a primary task . . . is to find ways and means of providing a more realistic description of the current, and changing, situation in economic development over the world than that provided by statistical tables which list countries as though all of one kind" (p. 21). Edward L. Ullman's short essay again takes up the question of sharp contrasts, even within countries, in the degree of under-development; while Philip L. Wagner, writing on the classification of economies, has a great deal to say that is both wise and useful. Nathaniel B. Guyol considers "energy consumption and economic development", and concludes (as have others before him) that "data on energy consumption afford one means of comparing levels of economic development, historically or geographically" (p. 76). Brian J. L. Berry is also concerned with the "regionalization of economic development", and records an interesting but laborious statistical exercise, involving no fewer than 43 indices, which tells us a great deal about the characteristics of the various groups of under-developed countries.

There are also a number of essays on more geographically specific topics: J. E. Spencer's on "The cultural factor in 'underdevelopment': the case of Malaya"; Ann Larimore's (marred by jargon) on the measurement of economic change in Busoga District, Uganda, by study of "the sequent development of occupance"; L. A. Peter Gosling's, very worth-while and thoroughly field-based, on the method of locating "problem areas" in Malaya by the use of a number of indices; and Allan Rodgers's on "Regional industrial development with reference to Southern Italy".

As is only to be expected, the essays vary considerably in interest and readability. A common theme of many of them is clearly the need to recognize the great differences in development that exist not only between one country and another, but within a single country. The stress that is put on this theme is to be commended for, in Mr. Guyol's words, "Many authors treat the underdeveloped world as essentially monolithic". A group of British geographers interested in the same problems would probably have placed more emphasis on such physically based phenomena as the difficulties of the tropical environment, which tend to be ignored by economists and others.

B. H. FARMER

THE ECONOMIC WORLD BALANCE. By THORKIL KRISTENSEN and associates. *Copenhagen: Munksgaard; Amsterdam: North Holland Publishing Co.*, 1960. 9¼ × 5¾ *inches; 377 pages; endpaper maps.* Dn. Kr. 46

The Foreign Policy Society of Denmark, which was founded in 1946 to advance interest in and understanding of international affairs, set up a study group of twelve members with varied interests (though dominantly economists) to assess present trends in economic development and to attempt some forecast of changes likely by 1980. For their specific purpose the world has been divided into nine economic regions —North America, Latin America, Western Europe, Eastern Europe (i.e. Communist states), U.S.S.R., The Middle East, Asia (i.e. from Afghanistan and Pakistan to China and Japan), Africa (excluding Egypt) and Oceania. The factors likely to be significant in influencing economic growth are treated in four groups—Labour, Capital, Nature (i.e. natural resources widely interpreted, including "beauty of scenery") and Culture, described as the way in which human beings live.

Many workers will find this a source-book of basic facts carefully collected, summarized and annotated and one which brings together points of view too often widely separated. Each of the four sets of factors is considered separately; then follow chapters on "models of growth" and fourteen pages of conclusions, and finally a lengthy appendix surveying each of the world regions in turn. Three years have been devoted to the work; the broad result is to confirm views already held and there is little new or startling in the conclusions that existing trends will be continued. Continued urbanization and decrease in those engaged in agriculture, increase in volume of trade are examples. The book is written on the assumption that no large-scale war will interrupt the process of development; the uncertainties are emphasized as mainly in the political sphere.

L. DUDLEY STAMP

CROP PRODUCTION AND ENVIRONMENT. By R. O. WHYTE. *London: Faber*, 1960. 8½ × 5 *inches; 392 pages; plates and text figures.* 63*s*

It is fourteen years since the publication of the first edition of this book, which deals essentially with the autecology of cultivated plants—that is, the relationship between "the individual plant and those primary factors of the aerial environment, temperature, light and darkness, which, at appropriate times, sequences and intensities, govern the maintenance of a vegetative condition, or a change from a vegetative to a reproductive state". It is a field of study vitally important in the maintenance and increase of food production in the world which has attracted a very large number of workers in recent years. Dr. Whyte gives what may be described as an interim report. We are introduced to an amazingly complex series of problems, where such "regulatory substances" as auxins and gibberellin play major roles undreamt of a generation ago. The first half of the book deals with the factors involved, the latter half with the various groups of economic plants. Whilst it is doubtless too early to state other than tentative conclusions, one feels that the author has been so overwhelmed by the seven or eight hundred works listed in his bibliography that he finds it difficult to see the wood for the trees. And there is an insufficient explanation of the plates and diagrams. In the application of principles to actual crops work seems to be very uneven, but an immense range of crops is considered.

This book should prove salutary reading to the phyto-climatologist and plant geographer. The happy acceptance of 42° and 43° F as a crucial temperature and the concept of accumulated temperatures and day degrees are seen to be concepts of increasingly doubtful validity when, in any given plant, optimum or even favourable conditions for the formation of fruit or seed are usually diametrically opposed to those required for vegetative growth or survival. It is salutary to be reminded that "conditions for optimal growth seldom obtain in the natural habitat, the plant may have become established there because of the particular vitality or its degree of adaptability to unfavourable conditions" (p. 160).

It is perhaps inevitable to find developing yet another terminology, and it may alarm the amateur gardener pottering about in his greenhouse to know that he is in reality

experimenting in thermoperiodicity and photoperiodicity in a primitive phytotron. If he will take the trouble to fit a neon sign which switches on in the middle of the night and dark blinds to draw in the middle of the day he may get startling results with his chrysanthemums—by preventing them from flowering at all. L. DUDLEY STAMP

FOOD RESEARCH INSTITUTE STUDIES. *Food Research Institute, Stanford University, Stanford, California*, 1, 1 (1960). 10 × 6¾ *inches; 103 pages; maps and diagrams. $7.00 yearly for three issues*

The staff of the Food Research Institute are already well known for their contributions to research in the production, distribution and consumption of food, and this new journal is intended to reflect their research interests. If the first issue may be taken as a guide to future numbers, a useful supplement will have been added to their long list of existing publications. Including a final brief comment on farm policy, three articles are contributed dealing with the U.S.A. Dr. Holbrook Working, writing on the "Price effects of futures trading", outlines for one agricultural commodity the part played by marketing practices in a sector of the U.S. economy and, incidentally, comments on a state of affairs now endemic to the sphere of economic policy: a situation where legislative control has been introduced despite an unresolved conflict of competent evidence and opinion. Dr. Working promises to extend his commentary in a future article. Meanwhile, limited in scope though it may be, his analysis of price movements in a highly developed commercial economy may remind readers of this review that a proper grasp of the nature and variability of crop distributions comes only in part from a professional appraisal of their physical environment.

This is not to deny the significance of physical conditions, and the present director of the Institute reaffirms their fundamental importance in his study of "Food crops and the isoline of ninety frost-free days in the United States". Dr. Bennett is concerned with 32°F frost and his main purpose in mapping this isoline is to apply an empirical test to the hypothesis that it marks one of the geographical "limits" to the production of food crops. The result is a thoughtful examination of the "cold zone" in which he takes great care to resolve the contingent problems of climatic classification and to define his terms of reference.

Finally, the position and prospects of "The smallholder in tropical export-crop production" are dealt with in a long article by Dr. Vernon Wickizer. His topic is large and important, bearing as it does upon the most complex and controversial issues in the field of tropical agriculture. Dr. Wickizer assembles a great deal of useful evidence; yet it is not too much to ask him, as a responsible economist, to face up squarely to the political and social aspects of his problem. By and large, he avoids such questions and, in consequence, even the modest conclusions drawn from his argument seem strangely incomplete. D. J. SINCLAIR

BIOGRAPHY

SIR HUBERT WILKINS: enigma of exploration. By JOHN GRIERSON. *London: Robert Hale*, 1960. 8¾ × 5½ *inches; 224 pages; maps and plates. 21s*

It is fitting that the biography of Sir Hubert Wilkins should be written by another polar airman and a pioneer in solo long-distance flights. The task is not easy, for Wilkins to the very end of his life was never one to "brook for long the cramping street"—he was always ready to go anywhere at any time. Therefore, in a biography which must include much fast-moving narrative of expeditions and travel in many different parts of the world, it would not be surprising if the personality of the subject tended to become submerged in the detail of his exploits. The Arctic with Stefansson, gallant service with the Royal Australian Flying Corps in the First World War, the Antarctic with Shackleton, an expedition to northern Australia, the Arctic Ocean by submarine and a series of pioneer flights and air explorations on nine separate expeditions to the Arctic and Antarctic between the two wars—these were only the highlights of Wilkins's remarkable career. Beyond the need for raising support for his expeditions, Wilkins

was modest and reticent to the point of being secretive about his activities. This did not make the task of his biographer any easier.

The author says that his aim has been "to give the unvarnished facts . . . leaving the reader to read between the lines". He has condensed admirably from Wilkins's three books and two unpublished reports about his expeditions, and has filled out the narrative from private papers and the personal reminiscence of friends. The book is illustrated with some interesting contemporary photographs but with barely adequate maps. Mr. Grierson shows that, if fortune favours the bold, it is also true that a deep religious faith and a mystical belief in his own destiny stayed Wilkins in all his exploits as explorer, airman, war correspondent, naturalist and photographer. However, the reader will find it difficult to form an assessment of his character. It is left for a future biographer, perhaps with access to material which may not now be available for publication, to show how the driving force and aspirations of the man of action and the visions of the mystic were woven into the complex personality of Sir Hubert Wilkins. In the present book Wilkins is given the high place in the history of polar exploration which is his right, he is portrayed as one who will be remembered in the annals of aviation and of war, and he is honoured among those submariners for whom the Arctic pack ice is no more than a canopy between sea and sky. G. HATTERSLEY-SMITH

GENERAL

INITIATION AUX TRAVAUX PRATIQUES DE GÉOGRAPHIE. By J. TRICART, M. ROCHEFORT and S. RIMBERT. 2nd edition. *Paris: Société d'Éditions d'Enseignement Supérieur*, 1960. $9\frac{1}{2} \times 6$ *inches; 235 pages; maps, diagrams*

This is a textbook on practical map techniques, of use to the student preparing for the "licence" in geography and to the first year student at an English university. The authors hope that the book will be particularly valuable to those who are unable to obtain formal teaching in the subject. The book is of interest to the English reader because of the original and lively way in which the facts are presented. It is simply and succinctly written in pleasingly clear French and is divided into two main parts. Part I is the larger and is entitled "Notions de cartographie"; Part II is called "Commentaires de cartes".

The ground covered in Part I includes a brief survey of the history of cartography, and chapters on geographical coordinates, maps and scales; sections and topographical analysis of maps; geological maps and structures; and the major types of relief forms. An essentially geographical viewpoint is maintained throughout and this is particularly well seen in the chapter on geological maps and stratigraphical ideas. The chapter on the use of sections and on topographical analysis has some interesting and ingenious points. Part II, as its title implies, deals with commentaries and descriptions of selected French sheets (both 1:80,000 and 1:50,000). Topics in both physical and human geography are discussed.

To the English reader some of the most useful material in the book is to be found in the appendices. In these are to be found notes on place-names, comments on the principal French topographical and geological maps and some useful definitions of certain rock names. The book is illustrated by over sixty black and white drawings; most of these are clear, but where hachures are used occasionally to show the relief the results can be muddling, as in Fig. 27, page 67. There is a short bibliography of French and German works relating to the different sections covered by the book. There is, also, an index of the technical terms used. M. M. SWEETING

THE DISCOVERY BOOKS. By OLIVE GARNETT. Books I–IV. *Oxford: Basil Blackwell*, 1949–59. 8×6 *inches; maps, illustrations. 7s 6d each*

With the recent publication of Book IV this series for Junior Schools is now complete. The author has put into textbook form the ideas developed in her book *Fundamentals in school geography* first published in 1934. The series has been planned with scholarly

thoroughness and great thought and care has gone into the selection of the material. The integration of the maps and pictures with the text is an outstanding feature of the books. The aim of each book is set out clearly in a preface for teachers, the emphasis being on encouraging children's own investigations and the development of a geographical vocabulary. At the end of each chapter are suggestions for things to do and advice on further reading is given.

Book I. Looking and doing: Part I "Round the year" deals with the work of an English farmer in each season as an essential basis for later work on the farmer's year in different climates. The chapters are planned to be read at the appropriate time of year. Part II deals with studies which can be carried on in the school environment, e.g. elementary map work, building houses and topics which introduce simple ideas of trade and transport.

Book II. Finding out: The theme is exploring the British Isles through a variety of topics which interest children, e.g. letters in the post, seaside resorts and transport by road, rail, air and water. One of the chief purposes of this book is to bridge the gap between large-scale local maps and maps of the British Isles. The technique of relating map and picture is particularly well developed and the idea of contours is skilfully introduced through the study of embankments, cuttings and a tunnel along a railway track.

Book III: Part I. "Exploring the world." Through discovering the world with the great explorers of the past, the children see the map unfolding itself stage by stage. The story begins with the journeys of Marco Polo and ends with Drake's circumnavigation of the world. Maps are used to develop the theme and a number of modern pictures are used appropriately.

Part II. "Map and globe." This part, which can be obtained separately, deals with geographical techniques needed for the intelligent use of an atlas. Latitude and longitude and map projections are explained simply and effectively. The book is designed to be used as the need arises in working through Part I.

Book IV. Pathfinding and pathmaking: The first third of this book continues the theme of exploring the world, taking the story on from 1600 to the present. Then, through the stories of a transcontinental railway, the Panama and Suez Canals and pioneer aviation the book attempts to show how the solution of transport problems makes fascinating stories and brings out facts of geographical significance.

All geographers will recognize the excellence of these books which demonstrate one way of teaching geography to juniors, giving an important place to the understanding of maps. They represent a departure from the more conventional approach of studies of a variety of peoples in their environment. They can be used most effectively by the more able juniors under the guidance of a skilled geography teacher. The emphasis on transport suggests that boys would follow the course with greater enthusiasm than would girls.

M. G. Goss

DIGGING FOR HISTORY. A survey of recent world archaeological discoveries 1945–1959. By EDWARD BACON. *London: Adam & Charles Black*, 1960. 9¹/₂×7 *inches;* 320 *pages; plates.* 50*s*

The author has been closely concerned with the archaeological features of the *Illustrated London News* for many years. There are two chapters devoted to the United Kingdom including an excellent reconstruction of the Temple of Mithras discovered during the erection of a new city office block, current activity at Canterbury and Verulamium, and restoration work at Stonehenge.

The survey ranges over archaeological research and discovery in various parts of Europe, in Egypt, Israel and Jordan, in Malay and Sarawak, in East Africa, and in Guatemala. The book also contains two chapters dealing with new field and laboratory techniques, the use of electrical resistance recording apparatus to eliminate some trial trenching, the further development of underwater exploration and the assistance of the fluorine and radio carbon tests, and X-ray spectrum analysis methods. Space is insufficient to mention the many items in this interesting work by Edward Bacon which

also contains sixty-three pages of photographs and reconstruction drawings by Alan Sorrell, and makes a most welcome addition to any library. M. M. SOUNDY

SHORTER NOTICES

Solace was the nine-ton auxiliary ketch in which Commander Victor Clark, R.N., made a 48,000-mile voyage, lasting from September 1953 to August 1958. Five years at a desk in the Admiralty needed some working out of the system; with Stanley Mathurin of St. Lucia in the West Indies as his only companion, Commander Clark is believed to have made the longest recorded voyage in so small a craft. Plenty of good photographs, endpaper maps and an enthusiastic literary style help the landsman to enjoy ON THE WIND OF A DREAM (*Hutchinson*, 1960, 30*s*), and the technical appendix and plan of the boat will interest yachtsmen. D. M.

* * *

Wright Miller, the author of RUSSIANS AS PEOPLE (*Phoenix House*, 1960, 25*s*) has made a number of visits, sometimes lengthy, to the Soviet Union and his acute observation has made this book one of the best accounts in English of the Russian people and their way of life. He displays not only great knowledge of how Russians live, think and behave, but also a sympathetic understanding which not every writer has accorded them. If, at times, the consciously sought effects of the political philosophy are underestimated, or the influence of the natural environment over-estimated, the book still succeeds in portraying the Russians as they really are in a way that, perhaps, only Sir Bernard Pares has done before. For those who know the country, it will recall vividly their memories; for those who do not, it will make them want to know. It is a book to be strongly recommended, not only for geographers, but for all who are concerned with better international relations and understanding. R. A. F.

* * *

OLD AND NEW ATHENS (*Putnam*, 1960, 35*s*) written by Demetrios Sicilianos and translated by Robert Liddell, is a history of post-classical Athens—a city which suffered under the successive domination of the Franks, Catalans, Venetians and Turks; a period often forgotten by the individual who only associates Athens with its classical temples and monuments. Mr. Sicilianos gives a detailed and interesting account of the Frankish towers, Byzantine churches and monasteries, Turkish mosques and fine old houses which have survived the tempestuous past, in the same way as have its inhabitants, with a steadfast courage and determination. A section of the book is devoted to famous Athenian families and eccentric (and often colourful) personalities. It is well illustrated with black-and-white photographs, and is an informative historical guide-book which the visitor to Athens will find extremely useful. A. E. U.

* * *

Suresh Vaidya's book about the Andaman and Nicobar Islands, ISLANDS OF THE MARIGOLD SUN (*Robert Hale*, 1960, 18*s*), will appeal to all those who are attracted by small and remote places. His account of a recent visit gives a clear impression of the Islands as they now are under Indian administration (though his publishers' blurb makes the over-large claim that it "for the first time reveals the real life of these little-known islands"). The book is readable enough, though spoilt in places by an excess of pointless dialogue; and there is some odd physical geography (pp. 84–5 and 191). B. H. F.

* * *

J. Tuzo Wilson will be known to many as the Professor of Geophysics at Toronto and the Chairman of the International Union of Geodesy and Geophysics. His ONE CHINESE MOON (*Michael Joseph*, 1960, 21*s*) is the account of his journey from Moscow to Peking via the Trans-Siberian Railway and Manchuria; then from Peking through Sian to Lanchow (which has grown to be a city of 800,000 people) and, eventually, to

Canton and Hong Kong. He records what he saw during his month in China; superficially, necessarily perhaps, on people and politics, most usefully on the work he saw being done in geology and geophysics in the universities and institutes of the New China. There are a number of references to geography and geographers (e.g. on pp. 136 and 197). The book bears marks of hurried writing, not least in that sure sign of an author trying to beat the clock, a series of very short concluding chapters.

B. H. F.

* * *

IN THE EAST A PHOENIX (*Hutchinson*, 1960, 30*s*) by Nigel Cameron takes the reader to the Hadramaut, Kashmir, Ceylon, Singapore and Malaya, Borneo, Bangkok, Hong Kong and Fiji and his photographer presents some very good pictures. Perhaps the most vivid descriptions are those of Kashmir and Ceylon. In Kashmir full appreciation is shown of beauty spots like Shalimar, the Nishat Bagh and the Dal and Wular Lakes, but it would have been informing to read more of the conditions and feelings of the Kashmiris themselves. The conclusion is reached that the population, 90 per cent. Muslims, would like to join with Pakistan, though friction between Hindu and Mahomedan seems to be rare. The book is readable, but not deep. It may stimulate the traveller to go and see for himself, which would be all to the good. H. St.C. S.

* * *

Dom Moraes is a poet of Portuguese descent, born and brought up in India, who has written an attractive travel book called GONE AWAY: AN INDIAN JOURNAL (*Heinemann*, 1960, 18*s*). Mr. Moraes's father is a well-known journalist and his son has certainly inherited reporting skill of a high order to supplement a poet's rather specialized outlook on the world. His interview with Mr. Nehru is a piece of high comedy; his encounter with the Dalai Lama strikes a more serious note; and his experiences at points along India's north-east frontiers form an interesting record of a continuing crisis.

D. M.

* * *

THE FLOWERY SWORD (*Hutchinson*, 1960, 25*s*) is the full and careful, though rarely memorable, record of Ethel Mannin's journeys in Japan. It will not be turned to for new light on the geography and society of Japan, but it is an interesting analysis of the impact on an observant Western mind of some features of Japanese life and of its cultural heritage. Miss Mannin reveals much of herself through her recorded reactions to hotel life, food and social habits; her journey was a test of courage as well as of endurance. Her interests were less in the changing character of modern Japan than in the symbols of the past, especially the shrines and temples, which are described at length. It is not easy to indicate what stood between Miss Mannin and a deeper understanding of Japan; perhaps the shortness of time, or her own reserve, or some lack of realization of the desperate struggle of individuals and of the nation to advance, economically, in these over-crowded islands of slender natural resources. M. J. W.

* * *

SPOOR OF BLOOD (*Bailey Bros. and Swinfen*, 1960, 21*s*) by Alan Cattrick traces the reduction of game in South Africa from the vast herds roaming the plains when the first Europeans arrived (Mr. Cattrick gives an estimate of 100,000,000 antelopes in those days) to the present near extinction of some species. The greater part of the book makes sorry reading as the indiscriminate wounding and slaughter of animals by the early hunters and explorers is described. The establishment in 1902 of the Sabie Game Reserve, later to become the Kruger National Park, came only just in time and was strongly resisted at first; but James Stevenson-Hamilton, who resigned from the Inniskilling Dragoon Guards to become Warden, was able to build up the depleted herds within the protected area and to leave to South Africa at the end of his forty years' service a treasured national possession. J. R.

* * *

CARTOGRAPHICAL PROGRESS

NATIONAL ATLASES

To *Petermann's Geographische Mitteilungen* (No. 1, 1961), Dr. Edgar Lehmann contributes some considerations on national atlases, occasioned by the papers read at the I.G.U. Congress at Stockholm, and the activities of the Commission on National Atlases. The aims of the latter body is to draw up a unified plan including a style for legends, to study the use of national atlases and its extension into the international field, and the problem of keeping the atlases up to date in rapidly changing conditions. Dr. Lehmann emphasizes the impracticability of imposing rigid uniformity on atlases dealing with areas contrasting greatly in size and in environment: the aim should be comparability, through scale, projection, generalization, use of colour, symbols &c., or through agreement on the thematic grouping within each atlas. But to lay down specific numbers or types of maps would be impossible; a structural map of a particular country will be supplemented by a varying number of additional maps, depending upon the complexity and interest of its structure. Comparison is not so much a question of what cartographical material already exists, but of the point of view from which this material is treated. Many existing national atlases have been compiled in response to the demands of national planning; consequently the approach is analytical, i.e. the mapping of individual crops or other national resources. Opposite to this Dr. Lehmann places the synthetic approach, where an attempt is made to represent a complex of factors, physical, economic or social. If it is not possible to combine all these on one map, the aim should be to produce a carefully related and designed series of maps, from which an understanding of the complex may be obtained. In the author's opinion, none of the atlases discussed at Stockholm fall decisively into either of these categories, though the analytical approach predominates. As an example, he quotes the *Atlas of Australian resources*, which does not contain a map of geomorphological regions, though it has good maps of erosion and of flooding. On the other hand, the communications map is superimposed on a population distribution map. With regard to differences of representation, he points out that the *Atlas of Canada* in mapping industrial output sometimes uses production figures and, in other instances, numbers of undertakings. This raises a point which often appears to be overlooked in these discussions; the cartographer is limited by the material at his disposal. The variation between national atlases is to a considerable extent due to the circumstances in which they were produced. If they are backed by a comprehensive research organization, they will obviously attain a high standard. But at the least it can be said that the analytical maps will reveal deficiencies, if any, in the statistical material.

Another source of valuable information on national atlases is the monograph, *Atlas nationaux; histoire, analyse, voies de perfectionnement et d'unification*, edited by Professor K. A. Salishchev for the Stockholm Conference. The Soviet geographer makes most of the points indicated above, and also illustrates indirectly what has been said regarding approach. In criticizing some national atlases, he complains of lack of maps covering financial structure and relations, and also social characteristics, a comment which tends rather perilously towards subjective interpretation. It is perhaps only fair to add that he has some criticisms to make of the *Atlas of the Byelorussian S.S.R.*

G. R. CRONE

MAP INTERPRETATION

Ability to interpret topographical maps is an essential requirement of all geographers, and five recent publications, listed at the end of this review, go some way to assist in this task. At the simplest level, interpretation is little more than "an exercise in translation" from the "shorthand" of the cartographer into the interpreter's mother tongue. At the highest level it is much more, involving first-hand knowledge of the ground, gained in the field. Such knowledge enables the skilled interpreter to discern

on the map patterns and relationships which he has overlooked or cannot discern in the field. It is not practicable for a geographer to know at first hand every area. For some areas, he must come to know the realities of the ground from the map alone; but unless he can bring to bear on his reading of it a background knowledge of similar terrain, he will obtain but an imperfect picture of the ground. Dr. Dury rightly emphasizes the importance of an adequate knowledge of geomorphology in map interpretation at all levels (Dury, 1960). To obtain from a topographical map its full significance, the would-be interpreter requires a knowledge of the physical and human history of the area and of the economy of its inhabitants.

Two of the books under review are new editions of tested manuals. John Bygott's well-established work, now almost a classic, has been reset for the seventh edition. D. C. Money, an experienced sixth-form geography master, has added a new chapter on the use of aerial photography in survey and map-making (Bygott, 1960). For the next edition he would do well to revise chapters XIV and XVI, for their content is not adequate for any of the students for whom the book is intended. The section on the interpretation of topographical maps provides sound instruction to ordinary and advanced levels of the G.C.E. examination. It is now twenty-six years since the first edition of John Bygott's book was published and the time, the present reviewer suggests, has come for Mr. Money to carry out some pruning and new planting. Its greatest merit today is its modest price.

G. H. Dury's book is much more limited in range of topics, but it has the merit of being written for one category of students only—the undergraduate. Those who master the principles which Dury lays down will indeed be well on the way to "a mastery of map interpretation". He has made few changes in the second edition. The only chapter to be modified noticeably is that on cartographical appreciation. Dury himself has joined H. C. Brookfield as its author and it includes additional examples of cartographical appreciation and comparison. The *Journal*'s reviewer of the first edition (*Geogr. J.* **119** (1953) 236) suggested the desirability of including some examples of subsequent synthesis into geographical regions, but evidently the author did not, and does not, agree, for he has not added any.

Of the new textbooks—J. H. Jennings's *Elementary map interpretation* (1960), based on maps of Nigeria, Ghana and Sierra Leone, is written especially for students of these countries preparing to answer the map-work question in the geography examination at Ordinary Level of the General Certificate of Education. For such students, it is admirable and it should prove a "boon and a blessing" to hundreds of West African students; it can be recommended to them without reservation. It contains useful map extracts as well as exercises. A. E. Meux's *Reading topographical maps* (1960) will be welcomed by hard-pressed school-teachers in this country. It deals especially with the problem of map and picture coordination, and includes a number of photographs carefully orientated to the maps they illustrate. The book contains a wide range of exercises which the auther has devised for training his own pupils in "compiling relevant, systematic answers" to examination questions.

And lastly, *How to use an atlas* (Hobley & Davies, 1960): this is a curious little manual designed to train children in the use of atlases. The authors tell us that "less able pupils need considerable practice before they can grapple with the index and the whole atlas". This is true, but will the less able be inspired by questions like "Calcutta in India is on the delta of what river?" (p. 47) or "What is Euboea? Of what country is it a part? Of what archipelago is it a member?" (p. 117). The work can be recommended only to those who desire to train for a geography quiz on television.

Bygott, J. 1960 *An introduction to map work and practical geography.* Seventh edition, revised by D. C. Money, and reset. London: University Tutorial Press, 17*s*

Dury, G. H. 1960 *Map interpretation.* Second edition. London: Sir Isaac Pitman, 15*s*

Hobley, L. F. and G. R. Davies 1960 *How to use an atlas.* London: Blackie, 4*s* 9*d*

Jennings, J. H. 1960 *Elementary map interpretation.* Cambridge University Press, 8*s* 6*d*

Meux, A. E. 1960 *Reading topographical maps.* University of London Press, 10*s* 6*d*

E. M. J. CAMPBELL

SPRACHENATLAS DES INDOPAZIFISCHEN RAUMES. By RICHARD SALZNER. *Wiesbaden: Otto Harrassowitz*, 1960. Two parts, 12 × 9½ *inches;* [I] viii + 138 *pages;* [II] *maps* 1–64. DM 100

In this work Dr. Salzner is concerned to show the geographical distribution and affinities of the languages spoken in the islands from Madagascar to Hawaii, Easter Island and New Zealand, to which he adds, in order to complete the delineation of the Austric stock, their congeners on the South-east Asian mainland. A series of outline maps give a conspectus of the whole area and of its principal regions, together with detailed distributions of language groups on scales varying from 1:400,000 to 1:25,000,000. The elegantly produced introductory volume contains a table of languages arranged according to their affinities, which serves as a key to the atlas, an alphabetical index of languages, a list of sources used, and a key to the numbers which mark places on certain of the maps.

This area is one of the greatest linguistic complexity, in parts difficult of access, and inadequately documented. As the atlas supplies a need of which linguists and ethnographers will be most keenly aware, so they too will be most aware of the respects in which caution is desirable. Ideally, many regions should be mapped in terms rather of the points at which languages have been recorded, than of inferred dialect areas as has been done here; but the second method is more generally intelligible. On the mainland, at least, ethnographic and linguistic schemata have sometimes been confounded, needlessly complicating the latter. It is more serious that the author often does not specify on which of his sources he relies in a particular case, especially since he has sometimes drawn on unpublished material. His classification of some languages would not find universal assent; but this hardly detracts from the value of his maps of them.

Such cavils must not be allowed to obscure the utility of Dr. Salzner's compilation. It is a formidable labour of learning; the source list enumerates over 500 maps, books and articles. And in a territory likely to remain imperfectly known for many years yet, reluctance to publish before complete information becomes available is the worst enemy of knowledge.

H. L. SHORTO

MAP ROOM OF THE BRITISH MUSEUM: RECENT ACQUISITIONS

Notes on the present state of the Map Room of the British Museum were published in a recent issue of this *Journal* (**126** (1960) 367–8). Some of the more important acquisitions since 1950 are listed below, with references to notices in the *British Museum Quarterly* (*BMQ*).

Baptista Boazio: engraved map of the Isle of Wight, 1591. (The only known impression. *BMQ* **21** (1957) 1–2.)

John Norden: map of Surrey, engraved by Charles Whitwell, 1594. (One of two known impressions from the plate in its earliest state. *BMQ* **16** (1951) 61–2.)

Philip Symonson: map of Kent, engraved by Charles Whitwell, 1596. (The only known complete impression from the plates in their earliest state. *BMQ* **21** (1957) 1–2.)

Anonymous [William Smith]: MS. maps of Hertfordshire, Worcestershire, Warwickshire and Cheshire, 1602–3. (Fair drafts of four county maps in the "Anonymous 1602–3" series, prepared as copy for a Dutch or Flemish engraver. Comparison with MSS. of William Smith, Rougedragon Poursuivant, establishes his authorship of these maps and, by inference, of the projected series, of which twelve maps are known in engraved versions. *BMQ* **22** (1960) 47–50.)

Jean Le Clerc: *Theatre Géographique du Royaume de France*, Paris 1619. (The only recorded copy of the first edition. *BMQ* **16** (1951) 60.)

Jodocus Hondius (the Younger): a collection of twenty-four engraved maps forming the nucleus of a world atlas, Amsterdam *c.* 1625.

C. J. Visscher: Long View of London, published by Frederik de Wit, Amsterdam *c.* 1650. (One of two known examples of the third version of this famous view. *BMQ* **18** (1953) 65.)

The Sport and General Press Agency, Ltd.

The Greenland Exhibition: left to right, Miss Maria Holm, Mr. Mikael Gam (Danish Minister for Greenland), the Rt. Hon. Sir David Eccles (Minister of Education), His Excellency M. Vincens de Steensen-Leeth (Danish Ambassador to London)

Ferdinand Verbiest, S.J.: world map engraved on wood at Peking, 1674 (printed from the original blocks at Keijo Imperial University, Japan, 1935).

William Hack: four MS. sea-atlases, formerly in King George III's Maritime Collection. (*a*) "Wagoner of the Great South Sea", dedicated and presented by Captain Bartholomew Sharp to King Charles II, 1682. (*b*) A similar atlas, dedicated by Hack to Lord Somers, 1698. (*c*) An atlas of the Indian Ocean, East Indies and China Sea, dedicated by Hack to Lord Somers, 1700. (*d*) An atlas of the Atlantic coasts of North and Central America and the West Indies, undated and without dedication. (*BMQ* **18** (1953) 63–4.)

Christopher Saxton: map of England (original edition 1583) as revised by Philip Lea, *c.* 1685–6. (Two sets of sheets printed from the plates at intermediate stages of Lea's revision.)

V. M. Coronelli: *Globi Differenti del P. Coronelli MDCCI*, published by Gli Argonauti, Venice 1701. (The second edition of Coronelli's very rare *Libro dei Globi*, with 139 plates.)

Japanese plan of Nagasaki, 1745.

James Ferguson: pair of "cricket-ball" globes, diameter 3 inches, Edinburgh *c.* 1750.

George Adams (the younger): "planetary globe", London *c.* 1790.

Trigonometrical Survey of England and Wales: original surveyors' drawings for the O.S. 1-inch-to-1-mile map, 1791–1824, comprising 320 2-inch sheets, seventy-five 3-inch sheets and thirty-one 6-inch sheets, with hill-sketches and revision sheets 1819–42. (*BMQ* **21** (1958) 59–61.)

Ino Chukei: map of Japan, Tokyo *c.* 1807.

Two Chinese roll-maps of the coasts of China, drawn *c.* 1840 (*BMQ* **18** (1953) 65–7.)

H. H. Kitchener: MS. Map of Western Palestine, 1872–7. (Field sheets, 1-inch-to-1-mile, of the survey made for the Palestine Exploration Fund by Lieut. H. H. Kitchener, R.E., with his field books.)

R. A. SKELTON

P.A-

H.R.H. Princess Margarethe of Denmark at the Society's Greenland Exhibi
20 February 1961

THE SOCIETY'S NEWS

MEDALS AND AWARDS

Her Majesty The Queen has approved the award of the Royal Medals as follows: The *Patron's Medal* to Mikhail M. Somov, Deputy Director, Arctic and Antarctic Research Institute, Leningrad, for polar exploration and research; and the *Founder's Medal* to John Bartholomew, C.B.E., M.C., LL.D., Editor, *The Times* Atlas of the World, for contributions to cartography.

The Council of the Society has made the following awards: *Victoria Medal* to Professor W. William-Olsson, Stockholm School of Economics, for contributions to economic geography; the *Murchison Grant* to Professor K. M. Buchanan, University College, Wellington, New Zealand, for contributions to economic geography; the *Back Grant* to Dr. Eric H. Brown, University College London, for geomorphological research; the *Cuthbert Peek Grant* to Dr. Martin W. Holdgate, Scott Polar Research Institute, Cambridge, leader of the Royal Society's expedition to southern Chile, 1959; the *Gill Memorial* to Dr. Cuchlaine A. M. King, University of Nottingham, for glaciological and coastal research; the *Mrs. Patrick Ness Award* to R. M. L. Mason and A. R. Hanbury-Tenison for their trans-continental exploratory journey in South America, 1960.

GREENLAND—THE ARCTIC DENMARK

An exhibition on Greenland was staged jointly by the Society and the Royal Danish Embassy at the Society's house from 9 to 27 February 1961. Designed by Mr. Søren Sass, it illustrated not only Greenland's landscape, climate, natural resources and wild life, but also the transformation of the Greenlanders' ancient culture and way of life by the intensive modernization programmes of the Danish Government, especially since the island's integration with the Kingdom of Denmark in 1953. Miss Maria Holm, wearing her Greenland dress, was on duty daily to answer questions and to show visitors round the exhibition. In addition to the Danish Government's exhibits, the Society displayed photographs and relics of exploration in Greenland by "Gino" Watkins's British Arctic Air Route Expedition (1930–1) and Commander C. J. W. Simpson's British North Greenland Expedition (1952–4).

The part played by both Danish and British explorers in Greenland was referred to by Lord Nathan, President of the Society, at the opening ceremony on February 8. He mentioned some of the British explorers who had received their polar training there, prominent among them Sir James Wordie, a Past President of the Society, and leader of no less than six expeditions from Cambridge to Greenland. Also present at the opening were Mr. Mikael Gam, Minister for Greenland in the Danish Government, His Excellency the Danish Ambassador and Madame de Steensen-Leth, and Sir David Eccles, Minister of Education. After a short speech by Sir David Eccles, in which he referred especially to the interesting carving in bone done in both ancient and modern times by the Greenlanders, Mr. Gam declared the exhibition open. This display, he said, marked the opening of a new era in Greenland, emerging from the long isolation first broken into by the events of the Second World War. It was the first wish of the Danish Government to help Greenland in every way to take her part in the modern world, without losing such of her old arts and skills as could still be of material and spiritual use to her.

Mr. Gam presented the President with the figure of a Greenland girl in Copenhagen porcelain, which has been placed in the Society's Museum.

On February 20 the exhibition was visited by Her Royal Highness Princess Margarethe of Denmark, who was received at the Society's house by Sir James Marshall-Cornwall, immediate Past President, by the Danish Ambassador and by members of Council and officers of the Society. In the course of the fortnight during which

the exhibition was open it was visited by 5043 people. This number included seventy parties from schools and the 600 Fellows and their guests who were present at Sir John Hunt's lecture of 27 February 1961 on his own expedition to east Greenland in the summer of 1960.

PRICE OF THE *GEOGRAPHICAL JOURNAL*

Increased costs of production make it no longer possible to avoid raising the price of the *Journal* to subscribers who are not Fellows or Members of the Society. The increase will be from 10*s* to 12*s* 6*d* a copy and will take effect from September 1961. The yearly subscription will be £2 13*s*, post free to any part of the world. The special rate for Fellows and Members requiring additional copies will be 9*s* 6*d* instead of 7*s* 6*d*.

PERIODICALS IN THE SOCIETY'S LIBRARY

An enquiry from the "Association d'étude pour l'expansion de la recherche scientifique", Paris, on the distribution and status of French periodicals abroad, coinciding with the preparation of a hand-list of current publications in the Society's Library, prompted an examination of the countries of origin and language of the Society's holdings. German titles (approx. 10 per cent. of the whole, including Austrian) slightly outnumber French titles (8 per cent. of which 2·3 relate to French overseas teritories; if Belgian titles are included, the total percentage is 9·6). The other language with a relatively wide cover is Spanish, Spain and the Americas accounting for 4 per cent. Against this is Portuguese, including Brazil, 2·8 per cent.

Of the titles in English, the United States of America accounts for 7·5 per cent. The next significant group are the Commonwealth countries, with the following percentages: Australia 3, Canada 2·5, India 2·2, New Zealand 1·2. The figure for South Africa is 1·25. The other countries with percentages exceeding 2 are the U.S.S.R., Italy, Sweden, Poland and Yugoslavia, in that order. Then above 1 and below 2 per cent. come Norway, Finland, Japan, Denmark and Holland. Finally there are three East European countries with a figure around 0·75; Bulgaria, Hungary and Romania. The remaining titles, other than British, are scattered fairly widely throughout the world. Approximately one-third of all periodicals received in the Library are British.

The list on which this note is based is not confined to periodicals of a strictly geographical character, and the degree to which allied subjects are represented must vary from country to country. Too much significance, therefore, should not be attached to the precise figures. However, allowing for special influences—political relations, the Society's interests and fortuitous circumstances, among others—they afford a rough guide to contemporary geographical activities.

THE RECORD

CONTRIBUTORS TO THIS ISSUE OF THE *JOURNAL*

Dr. Eric Axelson is Research Officer at the Ernest Oppenheimer Institute of Portuguese Studies, University of the Witwatersrand, Johannesburg. *Mr. R. A. French* is lecturer in the geography of Eastern Europe at University College London, and spent the academic year 1959/60 on a British Council exchange studentship at the University of Moscow. *Miss Alice Coleman* is a lecturer in geography at University of London, King's College. *Dr. R. J. Harrison Church* is reader in geography in the University of London. *Miss A. M. Ferrar* is librarian and map curator in the Department of Geography, University of Leeds. *Professor Sir Charles Cotton* is Emeritus Professor of Geology, Victoria University of Wellington, New Zealand; he was awarded the Victoria Medal in 1951. *J. R. V. Prescott* was until recently lecturer in geography at the University College of Ibadan, and did the field-work for his paper during vacations in Southern Rhodesia; he has now accepted an appointment in the University of Melbourne.

EXPEDITIONS IN THE FIELD DURING 1960

Reports have been received, and are in the Library, of expeditions which have had assistance from the Society, in the form of a money grant, of loan of instruments, or of the Society's official approval. All were in the field during the summer of 1960.

1. *Imperial College expedition to Iceland.*—David Kinsman, leader, and Ian Gibson joined Dr. G. P. L. Walker in Iceland and chose for their principal area of study the southern shore of Reydarfjordur, some ten miles from Budareyri. Detailed geological reports and maps are being prepared in the Geological Department of Imperial College.

2. *Imperial College expedition to Iran.*—J. W. Sheard led this four-man expedition to the Kalardasht valley, in the northern slopes of the central Elburz. Geological and botanical studies were made of the area, and sketch-maps drawn to accompany the report.

3. *London University geological expedition to Skidadalur.*—The aims of this expedition, led by P. G. Fookes, were to carry out a preliminary geological and geomorphological survey, with special emphasis on dykes and zeolites in conjunction with work now being done in eastern Iceland by Dr. G. P. L. Walker; plus a specialized soil survey for the University of Iceland and palaeomagnetic work for Cambridge University. A full report will be published when laboratory work is complete.

4. *London University expedition to North Iceland.*—Led by D. A. White of Queen Mary College, this expedition made a photo-theodolite survey of a glacier (Gljufurarjökull) by a new method, developing the plates in the field to ensure results. The developing was successful but the survey method proved unsatisfactory for this glacier. The lakeshore levelling in Fnjóskadalur was studied, and a small, hitherto unmapped, glacier was located.

5. *Oxford Andean expedition.*—Led by K. I. Meldrum, this expedition to the Peruvian Andes undertook a topographical survey and geological research; in addition, seven peaks of between 18,000 and 19,000 feet were climbed.

6. *Durham University expedition to the Faroes.*—Meteorology, botany, ornithology and geographical land use studies occupied this eight-man expedition under Michael D. Owen. In addition, research was carried out into certain basaltic land forms known as *goes*.

7. *Wye College Moroccan expedition.*—The expedition was led by Robert Savory and consisted of seven undergraduates of the University of London, and a Belgian ethno-musicologist. Its primary object was to investigate and report on the agriculture of the Berber tribes in the area surrounding Zaouia Ahanzal, forty miles south of Beni Mellal in the central High Atlas, and to make an appreciation and recordings of Berber music in this and other regions. Besides the agricultural work, a study was made of the traditional music of the area.

8. *Anglo-American Karakoram expedition.*—Wilfrid Noyce led this expedition to an unexplored region, and climbed a peak identified by Eric Shipton on the Hispar map (1939), namely Trivor (25,330 feet).

9. *British East Greenland expedition.*—This expedition of boys, led by Sir John Hunt and organized in conjunction with the Duke of Edinburgh's Award scheme, was the subject of a lecture at the Society on 27 February 1961. Separate reports have been received on "Strandlines in the Dammen region of Alpenfjord", "Weather and ablation" and "Ice temperatures of the Sefstrøm glacier".

10. *Scottish Spitsbergen physiology expedition.*—The main objective of this party, led by Dr. Hugh Simpson, was to study the effect of a twenty-one-hour daily routine on the human adrenal cortex, by a method described in the report. Climbing and survey work were carried out, and walking parties collected material and photographs for children's readers to be published by W. and R. Chambers.

11. *The Saltoro expedition.*—The expedition, led by P. J. Stephenson, explored the north, west and south sides of K.12 in the east Karakoram, and carried out mapping, geological and ethnological research.

12. *Cambridge expedition to La Palma.*—H. D. Woodward of St. John's College led this expedition to the Island of La Palma in the Canary Archipelago. Its objects in-

cluded research on: problems of weathering and stream erosion; land forms produced or altered by the eruption of Nambroque; water supply and agriculture; agricultural development and land utilization.

13. *Cambridge expedition to Svartisen.*—Led by C. C. J. Rhodes (Sidney Sussex College), the expedition's chief activity was to study the regime of the ice cap, special attention being paid to the flow characteristics of the outlet glacier, Østerdalzizen.

14. *Oxford University expedition to Ecuador.*—Led by P. J. Grubb, Fellow of Magdalene College, Cambridge, with M. R. Emerson, Balliol College, Oxford, as organizing secretary, this expedition took off from Quito for glaciological work on Mount Antisana and anthropological work in the Oriente. Botanical surveys were also made in two forest and one *paramo* area. The report contains a good map, photographs and useful appendices on the organization of the expedition.

15. *Oxford women's Azores expedition.*—The geographers in the expedition made a land use survey of Fayal and compared this with the land use on Pico. The geologists made a collection of rock specimens from Fayal and Pico. The zoologists studied the avifauna, collected snails for chromosomes study, and spiders for the first spider census on Fayal.

16. *British-Indian-Nepalese Himalayan expedition.*—This expedition was a combined operation of the British, Indian and Nepalese Services, and was led by Lt.-Col. J. D. M. Roberts, Military Attaché at Kathmandu. The ascent of Annapurna II, 26,041 feet, in west Nepal, was successfully achieved.

17. *Oxford and Cambridge Finnmark expedition.*—Led by J. R. Beck, the principal aim of this expedition was to study the daily pattern of activity of certain bird species and their adaptive significance under Arctic summer conditions. In addition, general observations were made on the structure of the bird communities in East Finnmark.

18. *Cambridge expedition to British Guiana.*—A six-man team led by R. M. Watson (Fitzwilliam House) travelled up the Essequibo River to a chosen site on the Moraballi Creek, with a view to: (i) making a survey of animals living in the litter and of factors determining their distribution; (ii) making an evaluation of secondary growth in tropical forest. Results await full analysis and the present report is a preliminary one in narrative form.

19. *Imperial College of Science and Technology expedition to Spitsbergen.*—Originally destined for Jan Mayen Island, this party was obliged by transport difficulties to go instead to Spitsbergen (Svalbard). It was led by Mr. Peter Smith and, at the suggestion of Dr. W. B. Harland (Geology Department, Cambridge), a survey was done of part of Dicksonland in central Vestspitsbergen as part of the map being prepared by Dr. Harland at the present time.

20. *Oxford University expedition to Cyrenaica.*—Martyn J. Webb led this expedition to its base in the plateau country of Gebel-el-Akhdar. Work included archaeological survey and excavations; geomorphological survey, measurement and underground investigation; soil survey and the collection of samples; filming. Reprinted from the *Oxford University Exploration Club Bulletin* No. 10, the report contains useful general advice to travellers in the region. The inclusion of these "hints" represents the practical and enlightened editorial policy of the *Bulletin* which deserves study outside its own immediate circle.

21. *Oxford Arctic Norway expedition.*—Led by H. T. Powell, member of the research staff at the Marine Biological Station, Millport, Scotland, the main aim of the expedition was to make a survey of the common intertidal plants and animals at selected sheltered and exposed sites on the coast of north-western and northern Norway.

22. *Oxford Icelandic expedition.*—Led by B. S. John and D. E. Sugden (both of Jesus College, Oxford), the expedition operated in the Drangajökull ice cap region of north-west Iceland. The aim was to study the land forms and ecology of a recently deglaciated valley, and reports on geomorphology and zoology are in preparation.

23. *Oxford University expedition to Turkey.*—I. H. Maddick (Keble) was leader and G. T. Prance (also of Keble) scientific leader of the expedition, the object of which was

to make taxonomic plant collections in western Turkey. Reprinted from the Oxford University Exploration Club Bulletin, this report contains useful expedition advice.

Reports have also been received from two 1959 expeditions:

Cambridge Colombian expedition 1959.—The general report of this expedition, led by D. R. Stoddart, is already in the Library and was noted in the *Journal* for March 1960, p. 113; and the special report on the Tunebo Indians was reviewed in the *Journal* for September 1960, pp. 377–8. The report has now been received of the glaciological party which worked on the San Pablin Glacier of the Sierra Nevada del Cocuy. It is illustrated by photographs and a map.

Cambridge expedition to Cyrenaica 1959. Led by C. J. C. Whimster, a seven-man team carried out investigations on the Gebel-el-Akhdar, a limestone plateau rising to a height of over 850 metres and extending for some 250 kilometres east of Benghazi, parallel to the coast of Cyrenaica. The report contains sections on water resources, speleology, cave fauna, the Pleistocene deposits of the El Atrun area and social studies in the El Gubba area.

THE IMPERIAL COLLEGE "AFRICA AND THE AMERICAS" EXPEDITION

A valuable report has been received from the three members of this expedition, the object of which was to travel overland through Africa and the Americas, making a survey of civil light aircraft and their activities. The expedition's programme was too far outside the range of the Society's activities to receive any aid, but the report contains information which should be of great practical use to travellers and research workers. Special attention is drawn to pages 79–98, which give the route from London to Cape Town; from Buenos Aires to Cartagena; from Punta Arenas to New York. Advice is given on the state of the roads, taking into account the time of year. The three members of the expedition were D. Hyde, M.SC., I. S. Gartshore, M.SC. and W. H. Melbourne, PH.D. The report is in the Society's Library.

THE GEOLOGICAL SOCIETY OF LONDON

The Geological Society has awarded the Lyell Medal for 1961 to Dr. J. V. Harrison "for his contribution to structural geology and his pioneer work in remote countries". Dr. Harrison, formerly Reader in Structural Geology at Oxford, became a Life Fellow of the Society in 1931, and has been a regular contributor to the *Journal*.

THE MAWSON INSTITUTE FOR ANTARCTIC RESEARCH

The University of Adelaide has founded an Institute for Antarctic Research in memory of the late Sir Douglas Mawson. It was opened at an inauguration ceremony on April 15, and the Society was represented by John Rymill, leader of the British Graham Land Expedition, 1934–7, who received the Founder's Medal for 1938.

POSTGRADUATE DIPLOMA IN CONSERVATION

Recognizing the paramount need for the conservation of natural resources in the world today and wishing to do something practical about it, the Nature Conservancy has cooperated with University College London in starting a postgraduate course in conservation. It is the first of its kind in the country. Teaching for the diploma is shared by the three departments of Botany, Geography and Zoology. Three special appointments have been made in these departments: Dr. R. J. Newbould (Botany), Dr. E. C. F. Bird (Geography) and Dr. F. B. O'Connor (Zoology).

Both in the United Kingdom and overseas there are openings for good all-round naturalists, but there is a dearth of suitably trained people to fill them; this, the course is designed to remedy. Students are selected from persons with suitable degrees in geography, botany, zoology, agriculture or forestry. The course lasts for one calendar year, beginning in July. It starts with a period of several weeks in the field, principally at the Conservancy's Field and Research Stations, aimed at breaking down the barriers between specialist disciplines and cultivating a unitary view of nature.

This is followed by two terms of lectures, practicals and seminars in physical geography, soils, land use, plant and animal ecology, and the theory and practice of conservation, supplemented by further field-work. In the third term students prepare a dissertation which, together with three written papers, comprises the examination for the Diploma.

This year, 1960–1, there are six students on the course, two geographers, two zoologists and two foresters. It is expected that a slightly larger number of students will be admitted next year.

Applicants should apply to the Registrar, University College London, Gower Street, W.C.1. The Nature Conservancy will again offer a limited number of awards to students accepted by the College.

THE NATURE CONSERVANCY

The need for conservation and the efforts of the Nature Conservancy to that end are becoming better understood and more widely accepted; and the decision, in 1959, of the University Grants Committee to enable the University of London to set up an advanced training course in conservation and ecology at University College, in close connection with the Nature Conservancy, is only one of many advances in the decade since its incorporation. The present report for the year ending September 1960 (*H.M.S.O.*, 1960, 6*s* 6*d*) deals first with conservation—management plans, progress on reserves, a list of new national nature reserves and other places protected, including sites of special scientific interest, such as geological sites, woodlands, pools, etc. Then follows an account of the scientific advisory service starting with the preservation of the coastline, dealt with by Professor J. A. Steers in the *Geographical Journal* in 1944 and 1946. The various topics in this section range from coastline to research on water supplies, toxic chemicals used in agriculture and consequent risks to wild-life, chemical spraying, the effect of fires on forests, heaths and moors, and mortality among foxes. Scientific research is being carried out on the fauna and flora in a number of stations which have been established in various parts of the country and a useful map is included showing the national, local and forest nature reserves and the positions of research and field stations.

The eight appendices summarize information concerning the work and composition of the Nature Conservancy and some idea of its growth may be gathered from the total number of staff at 30 September 1960—234, of whom ninety-five are scientifically qualified and carrying out scientific duties. This report should be read by all those interested in the preservation of irreplaceable scientific and amenity features, and our vulnerable flora and fauna, from excessive and unreasonable human pressure.

EDWARD HINDLE

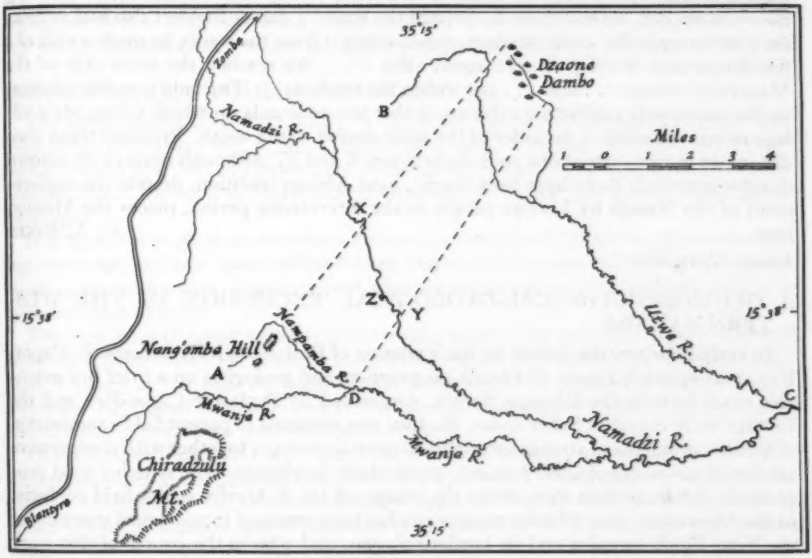
MOUNT EVEREST FOUNDATION

Expeditions desiring grants from the Mount Everest foundation are required in future to submit their applications in duplicate on a printed form that will be provided. Such applications addressed to: The Secretary, Mount Everest Foundation, 74 South Audley Street, London, W.1., should reach that office not later than 15 September 1961, 15 December 1961, 1 March 1962, according to the time of year when the Expedition in question is planning to leave. Applications arriving late for a particular date will be deferred until the next meeting of the Committee of the M.E.F.

THE LOCATION OF MAGOMERO, NYASALAND, 1861

The centenary of David Livingstone's fourth visit to Nyasaland affords a convenient opportunity for examining the available evidence as to the location of the mission station which he assisted Bishop Mackenzie to site during that visit. Whilst at Chibisa's (Chikwawa) and Mbame's the expedition and missionary parties received reports that the Yao were raiding in the vicinity of Zomba, the area first thought of as a site for the station, and, wishing to settle the Mission south of that point, Livingstone must have

had in mind one or other of the places which he knew more intimately; that is, places at which he had camped in 1859, either Soche's, Mongazi's, Chibaba's or Chisunze's. Whilst Bishop Mackenzie and Doctor Kirk preferred Soche's, only 30 miles from the head of navigation on the Shire, Livingstone realized that the further north the station, the greater the area which could be saved from Yao depredations, and he consequently dismissed both Soche's and Mongazi's. As a result of an armed attack by the Yao on 14 August 1861, near Chisunze's, he decided to recommend Chibaba's as the site for the mission station. By this time Chibaba (who had died) had been succeeded by Chigunda, and it is to a combination of early descriptions of Chibaba's and of later descriptions of Chigunda's that one must look for evidence of the site. No precise latitude seems to have been recorded by any of the persons who visited or settled at Chigunda's, but a map in David and Charles Livingstone's *The Zambezi and its tributaries*, drawn in 1865 and based on the observations of Dr. Livingstone, indicates a latitude of 15° 30′ 9″ S. and a longitude of 35° 20′ 2″ E. A map of the Shire area from José de Lacerda's *Exame das viagens do Doctor Livingstone* (1867), based on information



supplied by James Stewart, suggests a latitude of 15° 21′ 0″ S. The general location is given in Rowley's *The story of the Universities Mission to Central Africa*, and in Stewart's *Journal*, but for a more precise indication one is dependent upon Livingstone's journals.

Chibaba's was north of the Moenje and Napamba (Mwanje and Nampamba) rivers which Livingstone crossed on 2 September 1859, but south of the Mutue (Utwe) and Metse-a-bango which he crossed the following day. Thus Chibaba's must have been situated within an area bounded by a line joining the headwaters of the Nampamba and Utwe on the west, the Utwe on the north and east and a line joining the Utwe-Namadzi confluence with the Mwanje-Nampamba confluence on the south (A–B–C–D on the accompanying map). This field can be diminished if one considers it unlikely that, having travelled east of Chiradzulu mountain, Livingstone would then have gone west of Nang'ombe Hill, and again if one considers that "Metse-a-bango" is the "dambo" near Dzaone market, the only significant marsh in the area. Furthermore, the only river between the Nampamba and the Utwe which "contains a good body of water about 10 yards broad and 1 foot deep", or "generally knee deep", is the Namadzi, a

name which was used by none of the contemporary writers, who all use the name "Magomero" for both the river and the settlement. The precise location was within a meander of the river, on a peninsula 70–80 yards wide and between 150 (according to Livingstone) and 300 (according to Rowley) yards long. The Mission Report for 1862 gives the length as 200 yards. These considerations result in the site being on a peninsula somewhere on the Namadzi River between X and Y.

The question as to on which bank of the Namadzi the Mission settled is enigmatic. Of the available maps Livingstone's of 1865 places it on the north bank, Kirk's of 1863 places it on the south bank, whilst Wilson's of 1862 and Stewart's of 1867 both place it above the source of the river on neither bank. Recourse has therefore to be made to literary sources. One would imagine that with the belligerent Yao to the north, Livingstone would have settled the Mission on the south side of the river and indeed this is suggested by Rowley's words, "Some went to clear the ground for cultivation on the north side of us, over the river". Against this, however, are his words, when finally abandoning the Magomero site, which show that the river had to be crossed when leaving the station by a southward route. ("We resolved to go by Chiradzulu. . . . Taking the route we did, we had to wade through the river.") James Stewart also had to cross the river to enter the stockade when, approaching it from the south, he made a visit of a few hours with Rowley on 22 August 1862 (". . . we reached the other side of the Magomero stream . . . and . . . got within the stockade"). The only possible solution to this apparently conflicting evidence is that the peninsula on which Chigunda's village stood was within a meander of the river convex to the south. Precisely these conditions do in fact exist at one spot, Z, between X and Y. Although none of the known durable items left there have been traced, local African tradition, despite the replacement of the Nyanja by Lomwe people in the intervening period, places the Mission here.

C. A. BAKER

Dowa, Nyasaland.

A GEOMORPHOLOGICAL-GEOLOGICAL EXCURSION IN THE WESTERN SAHARA

In early February the writer, by the invitation of Professors J. Dresch and R. Capot-Rey, accompanied a party of French geographers and geologists on a brief but extensive study-tour in the Western Sahara. Organized by Professor Capot-Rey and the Institut de Recherches Sahariennes, the tour was designed to permit field examination of various problems of stratigraphic and structural geology, together with comparative studies of geomorphological features, particularly inselbergs. The detailed field programme and leadership were under the charge of Dr. P. Gevin, senior field geologist in the Algerian service, who for many years has been engaged in geological mapping of the Yetti-Eglab complex and its bordering areas, and who in the course of this work discovered the great iron-fields at Gara Djebilet. Travel was by charter aircraft from Algiers, supplemented by ground trips made in vehicles provided by the Military Administration, and by these means approximately 4500 miles were covered in eight days, over 3000 of them in the open desert. The route followed ran from Colomb Bechar to Tindouf, thence to Fort Trinquet, and so to the Fort Gouraud iron-field (Koedia d'Idjil). A lengthy air circuit southward then allowed us to see the remarkable ring-structures at Richat, the presumed meteorite crater of Timoumeur, and other volcanic craters before returning north to Gara Djebilet. From there a 500-mile traverse south across the Eglab was made in truck convoy to the oasis of Chegga. From Chegga the party travelled east to Chenachane oasis and thence back via Colomb Bechar to Algiers.

On so rapid and extensive a journey little formal research was possible; but since few if any professional geographers have as yet penetrated much of the area covered, even passing observations proved valuable. The great distances covered also allowed useful comparisons to be made, particularly in the field of physiography. The writer was impressed by the great variations in the forms of residual relief features carved from different types of rock, even minor differences in petrological character and

structure among the granite rocks apparently resulting in substantial differences in inselberg shapes. The widespread presence of a reddened and lightly-cemented layer in the fine sand a few inches below the gravel surfaces of the *regs* aroused much discussion, current French opinion being divided on its interpretation. Some believe it to be the product of modern conditions, others see in it evidence of a formerly more humid climate. More obvious evidence of the latter was seen in the deep water-dissection of many desert hill-ranges, particularly the Koedia d'Idjil, at Fort Gouraud, where two-stage valleys are displayed. Many other interesting problems were studied, particularly in the field of rock-weathering, while the methods of exploration of the two great iron-fields were explained and demonstrated to the party by technical personnel of the organizations concerned. At Fort Gouraud active working for stock-piling is due to start very shortly, the export railway to Port Étienne being scheduled for completion in 1963.

On the geomorphological side, the tour was not an end in itself, but designed in relation to a programme of geomorphological study of the arid lands decided upon by the Arid Zone Commission of the I.G.U. at Stockholm last summer. Having been appointed British Corresponding member of the Commission, the writer hopes that any British geographers working on desert problems will inform him of their studies.

R. F. PEEL

INDONESIAN JOURNAL OF GEOGRAPHY

The first number is in the Library of *Madjalah Geografi Indonesia* (the *Indonesian Journal of Geography*) Vol. 1, No. 1, September 1960. This new journal is to be published twice a year by the Department of Geography, Faculty of Letters and Culture, Gadjah Mada University, Jogjakarta, simultaneously in the Indonesian and English languages.

It is a particular pleasure to welcome a new learned journal from one of the developing countries, and this latest addition from Indonesia promises to be of great interest to the growing number of geographers who are concerned with South-east Asia as a specialist area of study.

The first issue (English edition) is sixty-eight pages long and is principally devoted to seven articles on a wide range of Indonesian topics. Most appropriately they begin with a study of "Trends in population change and food (paddy) production", by Professor Iso Reksohadiprodjo and Ir. Soedarsono Hadisaputro, which contains some useful information for so recent a year as 1955.

Other articles deal with "The mutual relationship between geography and the history of Indonesian culture and literature" (Prof. Dr. P. J. Zoetmulder), "Cultural revision in Indonesia" (R. Soemadi Soemowidagdo), "Morphology of the highland of Batur" (Dr. Kardono), and "Pressure of population in Klaten and its obvious results" (Dr. R. Bintarto), and finally Dr. M. Halim Khan, Head of the Department of Geography at Gadjah Mada University, contributes an informative survey of "Geography in Indonesia".

Altogether this is an encouraging first issue and geographers all over the world will look forward to those which are to follow and will wish the new venture every success.

CHARLES FISHER

PIUS XII COLLEGE, BASUTOLAND

The Geography Department of Pius XII College, Roma, Basutoland, is issuing a series of papers of which Nos. 1 and 2 have been received. Paper 1, "Dolerite dykes in Basutoland with special reference to the geomorphological effects of the dykes and their economic significance" is by Leo Meijs, Head of the Geography Department. It classifies these land forms according to their influence on relief into two divisions: trench dykes and wall dykes. Stress is laid on the effect of the dykes in determining the local and detailed topography, in particular their influence upon the drainage pattern and as determinants of positive and negative lineaments in the landscape. It is suggested that the dolerite is resistant to mechanical weathering but susceptible to chemical action. Thus a trench dyke, weathered out on the interfluves, forms a distinct break of slope where it crosses a river valley. The upstanding nature of the

wall dyke and the steep sides of the trench dykes are attributed to the resistant nature of the metamorphosed quartzites and hornstones which bound the intrusion.

The paper is well illustrated with highly instructive photographs and it is unfortunate that the written style is not of the same quality. The chief merit of the paper is that it provides innumerable good examples and photographs of differential weathering and erosion. For this reason it merits inclusion in a library collection. Paper No. 2 in the series "Notes on the occurrence of petrified wood in Basutoland", is also by Leo Meijs. D. BRUNSDEN

IBN KHALDUN'S CONCEPT OF THE GROWTH OF CITIES

An article was published recently in *Islamic Culture* 34, 2 (April 1960), Hyderabad Deccan, pp. 90–106, by Manzoor Alam, lecturer in geography at Osmania University. In this article, of which the full title is "Ibn Khaldūn's concept of the origin, growth and decay of cities", the author undertakes the task of analysing Ibn Khaldun's exposition of the principles of urbanization, and the growth of the city as a natural stage in the evolutionary cycle of civilization. In short, it is a detailed study of one aspect of the Muqaddima. It is useful to have material on this subject concisely arranged, although the scholar is still advised to consult "urban life" in the Appendix to Rosenthal's translation—a book which receives scant mention in this article. Here and there the author compares Ibn Khaldun's theories with those of Mumford and de la Blache and Griffith Taylor's view of a *Cycle of town evolution*. It is a pity he does not expand on this, or perhaps write an article in which the views of both Ibn Khaldun and western experts are analysed in far greater detail. It would enhance the useful material he has already compiled from his study of the Muqaddima. H. T. NORRIS

NOTES

Dr. H. L. RICHARDSON, head of the Agricultural Overseas Section, Billingham Division, Imperial Chemical Industries Ltd., and President of the Fertilizer Society, has been seconded to the Food and Agriculture Organization of the United Nations in Rome, for two years as Project Manager of FAO's Fertilizer Programme. This is a world-wide scheme, financed by the fertilizer industry as a contribution to the Freedom from Hunger Campaign, which aims at increasing food production in the underdeveloped countries by demonstrating the effective use of fertilizers. Dr. Richardson, a Fellow since 1940, spoke to the Society on 16 April 1945 on "Szechwan during the war". He spent six years, from 1937 to 1943, in Western China as adviser to the Agricultural Research Bureau of the Ministry of Agriculture.

* * *

The FIELD SURVEY ASSOCIATION announce that the Field Survey Prize for 1960 has been awarded to Mr. A. S. MacDonald of the Directorate of Overseas Surveys for his paper on "The application of electronic aids to field surveying". A prize of £50 is offered for a paper to be submitted to the Association by 31 December 1961 on one of three subjects announced. Full particulars of subjects and rules, and also conditions of membership of the Association, may be obtained from the Award Committee, Field Survey Association, Survey 2A, War Office, Whitehall, London, S.W.1.

* * *

The STATISTICAL ABSTRACT OF LATIN AMERICA 1960 has been received in the library, published by the Center of Latin American Studies, University of California. Closely printed and minutely analysed, the particulars in the *Abstract* are consistently related to sources, and much information is contained within its forty-eight pages.

* * *

The Standing Committee on National Parks of the Councils for the Preservation of Rural England and Wales and The Joint Action Group for the Protection of Dartmoor and Exmoor have issued a pamphlet entitled THE CASE FOR CONTROL OF AFFORESTATION OF OPEN LAND IN NATIONAL PARKS. It contains a strong plea for statutory control of commercial afforestation of open land in National Parks, particularly on Dartmoor and Exmoor; while welcoming the agreement announced on 13 February 1961 between the various interested bodies to consult with the National Park authorities, the Committees emphasize the need for vigilance.

* * *

The SOCIETY FOR CULTURAL RELATIONS WITH THE U.S.S.R. announces the resumption of a regular quarterly production, the *Soviet Social Science Bulletin*. Vol. V, Nos. 3 and 4, (Winter 1960/1) contains extracts from the Census published in 1959/60, and an article from *Planovoye Khozyaystvo* on economic development and problems in Siberia.

* * *

OBITUARY

THE RIGHT HON. THE MARQUESS OF ZETLAND, K.G., P.C., G.C.S.I., G.C.I.E., F.B.A.

By the death of the Marquess of Zetland on 6 February 1961 at the age of 84, the Royal Geographical Society has lost its most distinguished and senior Past President. As Earl of Ronaldshay, his early years were devoted to travel in the Indian Sub-Continent, Persia and Central Asia, where he not only acquired a first-hand knowledge of the geography of Asia, but also gained a deep understanding of, and sympathy for, the mentality and aspirations of the peoples of India. In 1900 he served as A.D.C. to Lord Curzon, then Viceroy, and was largely influenced by his example. Ronaldshay was elected a Fellow of the R.G.S. in 1901 and recounted his early travels in the East in four books published between 1902 and 1911. He was a member of the Society's Council from 1907 to 1910.

From 1917 until 1922 he served as Governor of Bengal, at a most difficult period when revolution was seething in that Province. Nevertheless, by combining sympathy with firmness, he succeeded in gaining the confidence and cooperation of those over whom he ruled. On his return from Bengal in 1922, Ronaldshay became a Privy Councillor and in the same year was elected President of the Royal Geographical Society, in which capacity he played a leading role in organizing the earlier attempts on the ascent of Mount Everest. He vacated the Presidency in 1925 and served as a Trustee of the Society from 1925 to 1947. It was during these years that his best-known books were published: *Lands of the thunderbolt: Sikkim, Chumbi, and Bhutan, India, a bird's eye view* and *The heart of Aryavarta*, which showed his sympathetic understanding of Indian aspirations. These were followed in 1928 by the authorized biography of Lord Curzon.

In view of Ronaldshay's profound knowledge of India and its peoples, and of his successful Governorship of Bengal, it was a disappointment that he was not nominated as Viceroy on Lord Reading's retirement in 1925. In 1929, on the death of his father, he became the second Marquess of Zetland, and in 1935 was appointed Secretary of State for India, a post which he held until the fall of Neville Chamberlain's Cabinet in 1940. It was therefore on his shoulders that fell the onerous task of steering the controversial India Bill through the House of Lords. Lord Zetland's last book, *Essayez* (his family motto), an autobiographical retrospect of his distinguished career, was published in 1957. His portrait hangs in our Council Room. J. H. MARSHALL-CORNWALL

MAJOR JAMES HAMILTON DAVIDSON-HOUSTON

The death of Major Davidson-Houston, of Pembury Hall, Kent, on 22 February at the age of 93, has deprived the Society of one of its senior members, as he was elected a Fellow of the Society in 1895 and until recently regularly attended the evening meetings. He graduated M.A. at Trinity College, Dublin, and was then commissioned in the Royal Inniskilling Fusiliers and served in the West Indies, Malaya and South Africa. During the First World War he was attached to the War Office, and then to the Ministry of Munitions and from 1919–22 was an Honorary King's Foreign Messenger. He was elected to the Geographical Club in 1915 and was by far its senior member, the next in seniority being Lord Zetland whose death is also recorded in this issue. E. HINDLE

MR. PETER HENRY

The death occurred in Chile, on 19 February 1961, of Peter Henry, leader of an expedition to the Patagonian Andes. The expedition, which received financial help from H.R.H. The Duke of Edinburgh, the R.G.S., the Mount Everest Foundation, the Royal Society and Leeds University, was engaged on a geological survey and on mountain exploration in the hilly country of the southern Chile ice cap. Peter Henry, who was 26 years old, lost his life when crossing Lake Nordenskjöld, an eight-mile stretch of water on which he was caught by a blizzard. His dinghy was later washed up empty on the shore. Henry was a highly enterprising and efficient leader with a considerable future before him. His death at so early an age is a loss which British exploration can ill afford.

MISS ANNIE J. WRIGHT, B.E.M.

Miss A. J. Wright, who died on 12 January 1961 in her 80th year, left her entire estate to the Society, of which she was elected a Fellow in April 1924. Miss Wright, who taught geography, was headmistress of Dover Road School, Folkestone, from 1927 to 1947. She was a keen naturalist, and had been for many years Assistant Secretary of the Folkestone Natural History Society. Her enthusiastic work for the National Savings Association was recognized by the award of the British Empire Medal in the New Year's Honours for 1958.

CORRESPONDENCE

EUROPE: HOW FAR?

Dr. Parker, in drawing conclusions as to the meaning and reference of *Εὐρώπη* in classical literature, seems to be at variance both with the sources and current scholarship (*Geogr. J.* **126** (1960) 278). He raises three questions: Is the geographical term basically a concept of a dichotomous relationship, i.e. West and East, Occident and Orient, Greece and Persia, etc.; or is the term specifically a place name, i.e. referent to a physically unique areal configuration? Thirdly, what is the known historical boundary of Europe east and north of the Archipelago (Aegean)?

In the first instance, it is suggested that the root word for Europe is the Semitic *ereb* meaning "sunset" *vis-à-vis* Asia, root word *acu*, meaning "sunrise". There is no evidence for this etymology as far as Europe is concerned in the earliest sources. If *ereb* were a borrowed root for a Greek word one would logically look for a term with the same meaning: *Erebos*, the Hellenic god of darkness, is a more likely prospect. On the other hand there is no reason why "Europe" should be viewed with suspicion (footnote 2) as stemming from an Indo-European root. *Eurotas*, *Europas*, *Euromos* are familiar place names with probably the same basic root. The classical evidence and

current scholarly opinion point to *Εὐρώπη* as at first a place-name which was broadened in its later usage to a relational term rather than the reverse.

Dr. Parker's alternative suggestion that Europe and Asia were first adjacent but contrasted areas, separated by the Sea of Azov or the Hellespont, is similarly without foundation. *Εὐρώπη* when first mentioned as a place-name in Greek literature, *The Hymn to the Pythian Apollo* (250, 290), does not appear "as the land along the north shore of the Aegean . . . distinguished from Greece proper". The *Hymn* (seventh century B.C.?) describing the temple to be built at Pytho (Delphi), distinguished three regions relative to it: the Peloponnesus, the wave-washed isles and Europe. From all accounts, Europe here probably refers to but one of three limited areas: the area of Dodona in the Epirus, the Europas plain in Thessaly, or the plain of Emathia in Macedonia. Neither the suggestion of "sea-shore" nor "non-Hellenic" is present. Consequently, the citation in Herodotus on Xerxes (fifth century B.C.) is not of similar reference or meaning.

Εὐρώπη takes on a broader connotation for the first time in Hecataeus, who, as far as one can judge, divided the *oikoumene* into but two parts, Europe and Asia. Libya was not separate from Asia as shown in Figure 1, the Hyrcanian (Caspian) Sea was not connected with the outer Ocean, nor was the Tanais a place-name in the *Periegesis*—it does not appear in the Müller and Jacoby fragmenta as such. In fact in the critical eastern Black Sea region the fragments are contradictory. It is going beyond the available data to suggest that the isthmus between the Black and Caspian Seas was the earliest boundary. It is not possible to know.

The implication in footnote 8 that Herodotus viewed the Caspian as part of the outer Ocean, or that the boundary between Europe and Asia was the isthmus, cannot be fully sustained. Herodotus, as noted, did not believe in a continental division of the *oikoumene* at all, he was only reporting what others believed. Hence, he gives various opinions: that the Caspian is closed (I. 203), that the Caucasus Mountains being the boundary of Colchis are the boundary of Asia (III. 97), that the Phasis is the boundary (IV. 38), that the Tanais is the boundary (IV. 45). Evidence of conflicting views on these points both precede and follow the Herodotean account. Aeschylus, for example, cites the Phasis (fr. 106, Loeb edition), the Hellespont (*Per.* 799), and the Cimmerian Bosporus/Maeotis (*Pr.* 412, 735) as the boundary and furthermore places "sea-girt islands" between the continents (*Per.* 885; also *Herodotus*, III. 96). In the Hippocratic corpus (*Airs, Waters, Places*, 13, 17) Lake Maeotis is the boundary, yet the Sauromatae who at this time are generally placed east of the Tanais and Lake Maeotis are called a European tribe.

Footnote 10 is in error in all particulars. Strabo does not know the source of the Tanais and makes no suggestion as to a possible connection with the Northern Ocean. The Tanais of Ptolemy rises in the vicinity of the Rhipaean Mountains, the Rha (Volga) in the Hyperborean Mountains. The two ranges are not the same and have no relation to P. Mela's description (Fig. 2). Furthermore, neither Strabo nor Ptolemy make the Tanais comparable to the Nile, in fact Strabo takes pains to point up the differences (*St.* XI. 2. 2; *Pt.* III. 5. 4–5, V. 8. 6–7).

Nevertheless, Dr. Parker is undoubtedly right in asserting that "Europe" and "Asia" were early "endowed with emotional undertones". As he notes, it is evident in Herodotus (I. 4–5, IV. 40) but it occurs earlier in Aeschylus. Even as early as Hecataeus (sixth century B.C.) one can speculate as to the inclusion of Chios, Lesbos, Lemnos and Tenedos in Europe as being largely a division dictated not by the configuration of the land and sea but by trade, diplomacy and politics.

F. LUKERMANN
Department of Geography, University of Minnesota
6 November 1960

Dr. W. H. Parker replies:

Mr. Lukermann writes that I "draw conclusions" as to the meaning of Europe in classical literature which are "at variance both with the sources and current scholarship", whereas all I actually do is to give the opinions of two eminent German scholars

(Ritter and Louis) who have investigated the problem. Nothing could be less conclusive than the way in which these opinions are presented ("If the name Europe, as some believe. . . . Or it may have originally represented" . . .). I am aware that some scholars do not accept either of them, but cannot agree that they are "without foundation". I give the view preferred by Mr. Lukermann in footnote 2 for what it is—a third opinion. Sources are surely too scanty and obscure for such confident assertions of truth and error as Mr. Lukermann chooses to make. As he says himself, "it is not possible to know".

Footnote 10 ("According to Strabo, the Don flows between the Sea of Azov and the northern ocean; according to Ptolemy, it rises in the Hyperborei Montes, an alternative name for the Riphaean Mts.").is condemned as "in error in all particulars". Yet Ptolemy's maps (e.g. the 1490 Rome edition) show both the Tanais and the Rha as flowing from the Hyperborei Montes, and if it is an error to believe that the ancients confused these with the Riphaei Montes, it is a mistake made also by the great Renaissance scholar Cluverius who devoted a lifetime to the study of the geography of the ancient writers: "ultra Riphaeos sive Hyperboreos montes" (*Germania Antiqua*, 1616, p. 21).

My location of the Europe of the Hymn to Apollo was not happily phrased as "the land along the north shore of the Aegean"; "northern Greece" would have been better. But it is probably no coincidence that the Hymn, Xerxes and Aristotle all refer to a restricted Europe in this area. Mr. Lukermann's other strictures arise from a hypercritical appraisal of two short introductory paragraphs which, from their summary nature, necessariiy give a generalized and imperfect picture. Nevertheless, apart from its dogmatic nature, I welcome his letter as an elaboration of some of the points touched on in the article.

W. H. PARKER

Winnipeg, 3 January 1961

MEETINGS: SESSION 1960–61

Meeting of 6 March 1961. The President in the Chair

Paper: The economic regions of Poland. By Stanislaw Leszczycki

Meeting of 13 March 1961. Lady Ravensdale in the Chair

Elections to Fellowship: G. K. Conolly, M.A.; Peter Crabb, B.SC.; Alan Downes; Miss Patricia V. Evans, B.SC.; Felix Gluck; Roger C. Herrera; Miss Jennifer Hocken; Anthony R. Hudson, B.A.; Harold Hyde; Ivan P. Jolliffe; D. G. Joshi, B.A.; David J. Nobbs; Sir Duncan Oppenheim; Roger W. G. Penn; Cyril H. Redhead, M.A.; Michael J. Richardson; Gordon E. Saunders, B.SC.; Miss Josephine Sear; Ronald A. G. Sibley; James W. E. Voller; Luke J. P. Yip

Elections to Associate Membership: James N. Adam; Clifford C. Fryer; Miss Sarah James; Charles L. Markus; James Statham; Graham A. Young

Films: The Borneo story

Meeting of 20 March 1961. The President in the Chair

Elections to Fellowship: John S. Ball; Miss L. G. Calderwood; Sidney D. Holton; Timothy C. A. Horn; Raymond J. Humphry; Mrs. F. M. Langton; Francis M. Langton; Keith J. F. Mitchell; Peter M. Patchell, M.A.; Arthur R. Porter, B.SC.; Miss M. Pountney; Mrs. N. Senathirajah, B.SC.; Miss C. M. Stunden; Miss B. M. Starkings, B.SC.; Stanley R. Vigers; W. E. Wardle, B.SC.; Miss Audrey Weston; John T. Weston

Election to Associate Membership: John H. Curtis

Paper: Birth of a city: Brasilia. By Sir William Holford